

EXHIBIT 5

■ **KITCHEN KNIGHT® II:
RESTAURANT
FIRE SUPPRESSION
SYSTEM –
PCL-300/460/600**



TECHNICAL MANUAL

- **COMPONENTS**
- **DESIGN**
- **INSTALLATION**
- **MAINTENANCE**
- **RECHARGE**

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CHAPTER I

GENERAL INFORMATION

INTRODUCTION

The Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System is of the pre-engineered type as defined by NFPA-17A Standard for Wet Chemical Extinguishing Systems and is designed to provide fire protection for restaurant cooking appliances, hoods, and ducts. Installation and maintenance of the system must conform to the limitations detailed in this manual and be performed by an Authorized Pyro-Chem Kitchen Knight II dealer.

The Pyro-Chem Kitchen Knight II System utilizes a wet chemical agent specifically designed to suppress restaurant cooking area fires. The system provides automatic actuation and can be manually actuated through a remote mechanical pull station. Upon actuation, the system discharges a pre-determined amount of agent to the duct, plenum, and cooking appliances. The agent acts to suppress fires in three ways:

1. The chemical chain reaction causing combustion is interrupted by both the agent itself and the resulting steam formation.
2. The agent cools the fire bringing it below auto-ignition temperature.
3. The agent reacts with hot grease forming a soap-like layer (saponification) that helps prevent the escape of combustible vapors, thus preventing re-ignition.

The shutdown of fuel and power to all appliances under protected ventilation equipment is required upon system actuation. The shutdown of make-up or supply air is recommended upon system actuation but is not required. Exhaust fan(s) in the ventilation system should remain on during system discharge as they assist the dispersion of chemical through the ventilating system. The system is UL Listed with or without exhaust fan shutdown.

TEMPERATURE LIMITATIONS

The operating temperature range of the Pyro-Chem Kitchen Knight II System is 32° F. (0° C.) minimum to 120° F. (49° C.) maximum.

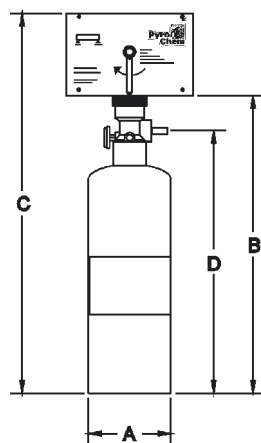
UL LISTING

The Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System has been tested to the UL Standard for Fire Extinguishing Systems For Protection of Restaurant Cooking Areas, UL300 and Listed by Underwriters Laboratories, Inc. System agent cylinders bearing the Underwriters Laboratories of Canada, Inc. ULC mark also meet Underwriters Laboratories of Canada's Standard ULC/ORD-C1254.6-1995.

CHAPTER II COMPONENTS

CYLINDERS & VALVE

The Pyro-Chem Kitchen Knight II System has available three different size cylinders: the Models PCL-300 (P/N 551194), PCL-460 (P/N 551193), and PCL-600 (P/N 551196). Cylinder sizes are expressed in terms of extinguishing agent capacity (i.e., the PCL-300 uses 3.0 gallons of extinguishing agent). The cylinder is manufactured, tested, and marked in accordance with DOT 4BW225. Cylinders come pre-filled with extinguishing agent and are charged with dry nitrogen to a pressure of 225 psig @ 70° F. Cylinder and valve assembly dimensions are shown in **Figure 2-1**.



Model No.	A	B	C	D	Max. Flow Point Capacity	Weight	Mounting Bracket Used
PCL-300	8.00	25.06	30.81	22.75	10	53 lbs.	MB-15
PCL-460	10.00	25.06	30.81	22.75	15	83 lbs.	MB-15
PCL-600	10.00	35.81	41.56	33.50	20	108 lbs.	MB-1

Figure 2-1. Cylinder and Valve Assemblies.

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All cylinders utilize the same valve assembly (P/N 551175). It is a pressure sealed poppet type valve designed to provide rapid actuation and discharge of agent. See **Figure 2-2**.

Item	Part Number	Description
1		Valve Body
2	550762	Cap & Seat Washer Sub-Assembly
3	550705	Conical Spring
4	550707	Piston
5	550716	Neck O-Ring
6	550713	Pressure Gage
7	550028	Stem O-Ring
8	550802	Valve Cap
9	550386	Shrader Valve Ass'y
10	550714	Valve Cap O-Ring
11	550715	Piston O-Ring
12	550710	Valve Stem
13	551256	Pressure Regulator
14	551261	Seal
15	17851	6-32x3/8 Screw

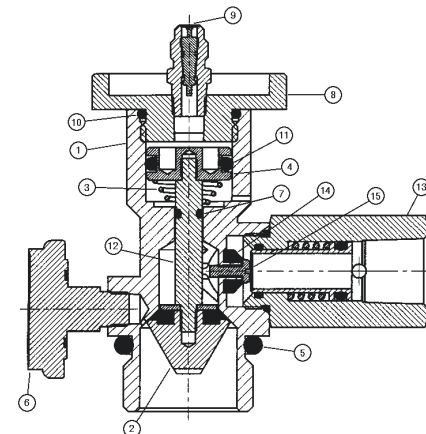


Figure 2-2. Valve Cross Section.

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VALVE REBUILDING EQUIPMENT

1. Wet Valve Seal Rebuilding Kit (P/N 550698).

After system discharge, the valve assembly must be rebuilt to ensure proper future operation. The Wet Valve Seal Rebuilding Kit (P/N 550698) should be used. It includes all components necessary to properly rebuild the valve. See **Figure 2-3**.

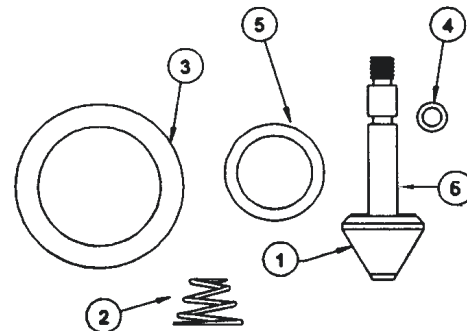


Figure 2-3. Wet Valve Seal Rebuilding Kit (P/N 550698).

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Item	Part Number	Description
1	550762	Cap & Seat Washer Sub-Assembly
2	550705	Conical Spring
3	550716	Neck O-Ring
4	550028	Stem O-Ring
5	550715	Piston O-Ring
6	550710	Valve Stem

2. Pressure Regulator Assembly (P/N 550985).

The pressure regulator assembly is available if the complete regulator requires replacement (i.e., possible thread damage).

3. Pressure Regulator Rebuilding Kit (P/N 551061).

After system discharge, the pressure regulator must be rebuilt to ensure proper future operation. The rebuilding kit (P/N 551061) should be used. It includes all components necessary to properly rebuild the regulator. See **Figure 2-3.1**.

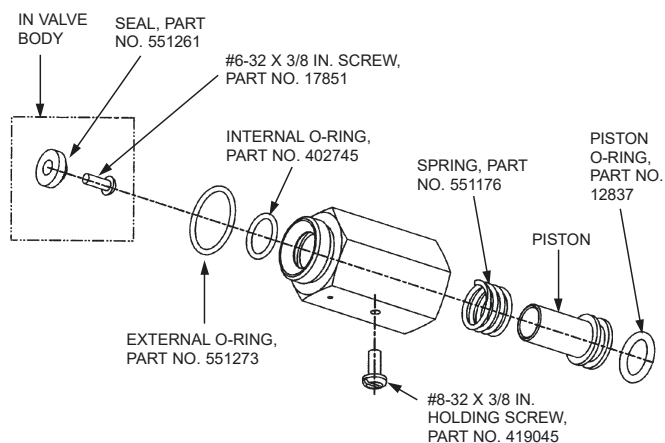


Figure 2-3.1.
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4. Model VT-1 (P/N 550788).

The Model VT-1 wet valve tool is designed to facilitate the rebuilding of the wet valve assembly. It should be used to hold the wet valve piston while unscrewing the cap and stem assembly. See **Figure 2-3.2**.

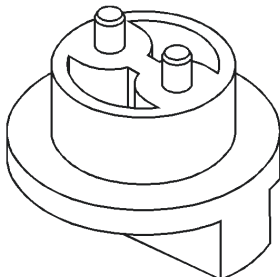


Figure 2-3.2. Model VT-1 Wet Valve Tool.
002907PC

CYLINDER BRACKETING

Vertical bracketing of the PCL-300 and PCL-460 is provided by the Model MB-15 bracket kit (P/N 550054). Vertical bracketing of the PCL-600 is provided by the Model MB-1 bracket kit (P/N 550053). These kits must be ordered separately with each cylinder/valve assembly. Cylinder installation instructions are provided in the installation section of this manual.

EXTINGUISHING AGENT (P/N 551188)

The agent used in Pyro-Chem Kitchen Knight II Systems is a potassium carbonate based solution that is extremely effective for grease related kitchen fires. This agent is available for cylinder recharging in 3.0 Gallon containers (Model PCL-300). For MSDS information, contact Pyro-Chem at 800-526-1079 or 715-732-3465 or www.pyrochem.com.

CAUTION

Precautions must be taken when handling and transferring wet agents as they are caustic in nature. Goggles must be worn at all times. If any agent gets into the eyes, they should be flushed with clean water for 15 minutes and a physician contacted. If any agent contacts the skin, it should be flushed with cold water to prevent irritation. The agent is electrically conductive. Care must be taken to thoroughly clean up any agent discharged around electrical appliances before turning the power on.

After system discharge, agent must be cleaned up immediately with hot, soapy water to prevent corrosion of effected surfaces.

MODEL MCH3 - MECHANICAL CONTROL HEAD (P/N 551200)

The Model MCH3 mechanical control head is a fully mechanical control head which can be connected to the PCL-300/460/600 cylinder valve. This control head will support a fusible link detection system, a remote mechanical pull station (Model RPS-M), and a mechanical or electric gas shutoff valve. A miniature electric switch (Model MS-SPDT, MS-DPDT, MS-3PDT, or MS-4PDT) can be ordered separately and field installed. It is equipped with a local manual control handle that allows for mechanical system actuation. Operation of the local manual control requires removing the pull pin and rotating the handle clockwise. The Model MCH3 control head can actuate a maximum of three (3) cylinders. See **Figure 2-4**.

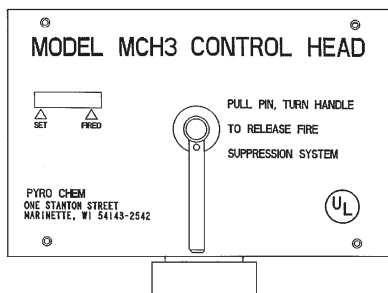


Figure 2-4. Mechanical Control Head.
004790PC

MODEL ECH3 – ELECTRIC CONTROL HEAD

The Model ECH3 electric control head is an electrically operated control head which can be connected to the PCL-300/460/600 cylinder valve. This control head will support an electric thermal detection system, a remote mechanical pull station (Model RPS-M), and an electric gas shutoff valve. It will not support a fusible link detection system. A miniature electric switch (Model MS-DPDT) is included. The Model ECH3 control head is available in both 120 VAC (Model ECH3-120, P/N 551202) and 24 VDC (Model ECH3-24, P/N 551201). It is equipped with a local manual control handle that allows for mechanical system actuation. Operation of the local manual control requires removing the pull pin and rotating the handle clockwise. The Model ECH3 control head can actuate a maximum of three (3) cylinders. See **Figure 2-5**.

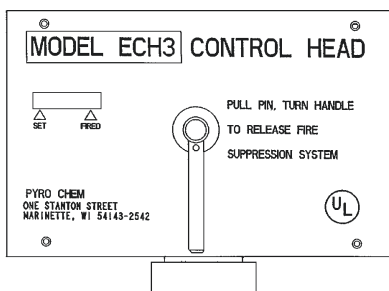


Figure 2-5. Electric Control Head.
004789PC

MODEL NMCH3 - MECHANICAL CONTROL HEAD (P/N 551203)

The Model NMCH3 Mechanical Control Head is a fully mechanical control head which can be connected to the PCL-300/460/600 cylinder valve. This control head will support a fusible link detection system, a remote mechanical pull station (Model RPS-M), and a mechanical or electric gas shut-off valve. A miniature electrical switch (Model MS-SPDT, MS-DPDT, MS-3PDT, or MS-4PDT) can be ordered separately and field installed. There is no local manual actuation for the Model NMCH. The Model NMCH3 control head can actuate a maximum of three (3) cylinders. **The Model NMCH3 can be used as a direct replacement for the Model MCH3.**

MODEL EN-MCU3 ENCLOSURE (P/N 551208)

The Model EN-MCU3 Enclosure is used for vertical mounting of a single PCL-300 or PCL-460. The EN-MCU3 also includes a mechanical control unit, eliminating the need for a Model MCH3 Control Head. See **Figure 2-6**. *The PCL-600 cannot be mounted in an EN-MCU3.*

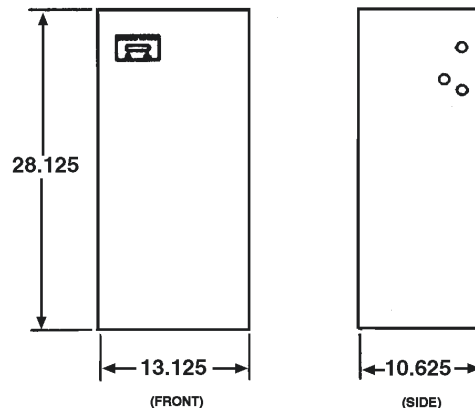


Figure 2-6. Model EN-MCU3 Enclosure.
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MODEL EN-S ENCLOSURE (P/N 550966)

The Model EN-S Enclosure is used for vertical mounting of a single PCL-300 or PCL-460 when it is used as a secondary agent cylinder in a system. The EN-S has no control mechanism, and must be used in conjunction with a Model EN-MCU3 Enclosure or a Model MCH3/ECH3 Control Head. *The PCL-600 cannot be mounted in an EN-S.*

MODEL MB-P2 – CONTROL HEAD MOUNTING BRACKET (P/N 550853)

The Model MB-P2 mounting bracket must be used to mount the Model MCH3, NMCH3, or ECH3 control heads if the control head is not mounted directly on a cylinder valve. See **Figure 2-7**.

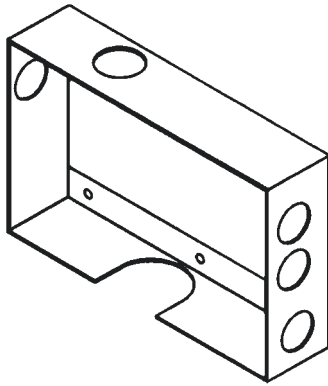


Figure 2-7. Model MB-P2 - Control Head Mounting Bracket.

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PNEUMATIC ACTUATING CYLINDERS

1. Model PAC-10 (P/N 550104).

The Model PAC-10 is a pneumatic actuating cylinder that can actuate a maximum of ten (10) agent cylinders simultaneously. The Model PAC-10 includes a DOT 4BA350 cylinder pressurized with dry nitrogen to 350 PSIG @ 70° F., a brass valve with pressure gauge, and a wall mounting bracket. A Model MCH3, NMCH3, or ECH3 control head must be purchased separately and connected to the PAC-10 to open the valve. See **Figure 2-8**.

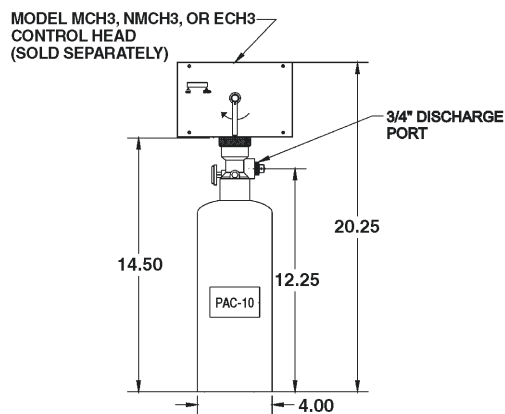


Figure 2.8. Model PAC-10 Pneumatic Actuating Cylinder.

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DETECTION EQUIPMENT**1. Model FLK-1 (P/N 550131).**

The Model FLK-1 fusible link kit includes a 10" steel bracket, two (2) 1/2" EMT connectors, two (2) cable crimps, and two (2) "S" hooks. Fusible links must be ordered separately. See **Figure 2-9**.

2. Model FLK-1A (P/N 550132).

The Model FLK-1A fusible link kit includes an 8" steel bracket, two (2) 1/2" EMT connectors, two (2) cable crimps, and two (2) "S" hooks. Fusible links must be ordered separately.

3. Model FLH-1 (P/N 550876).

The Model FLH-1 fusible link hanger is an accessory designed to simplify the installation of fusible links in the fusible link line. It can be used with the Model FLK-1/1A fusible link kit (kits must be ordered separately). The Fusible Link Hanger makes it possible to install fusible links without cutting and crimping loops in the fusible link line for each link. They are available in packages of 25 (FLH-25) only. See **Figure 2-10**.

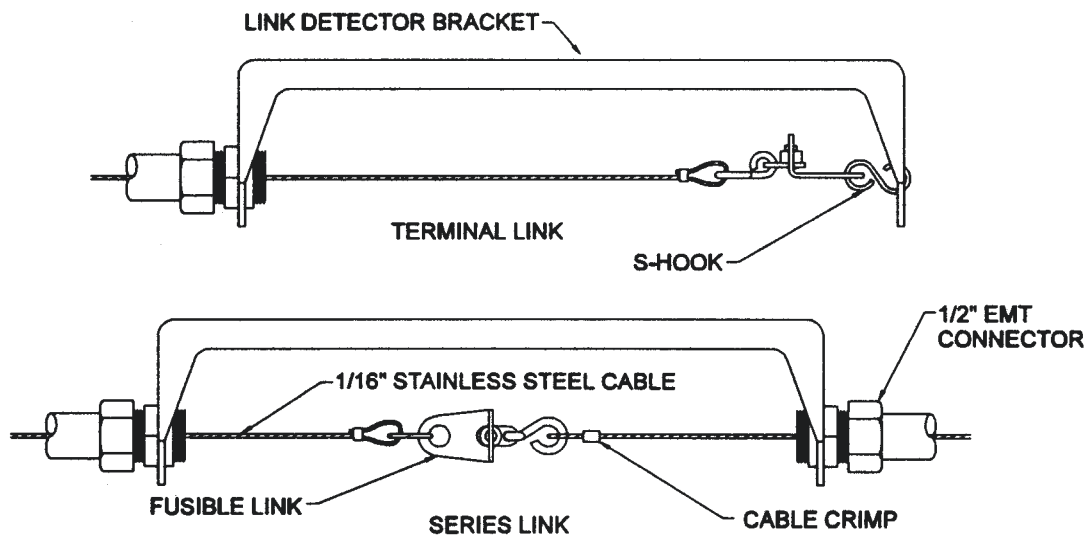


Figure 2-9. Model FLK-1 Fusible Link

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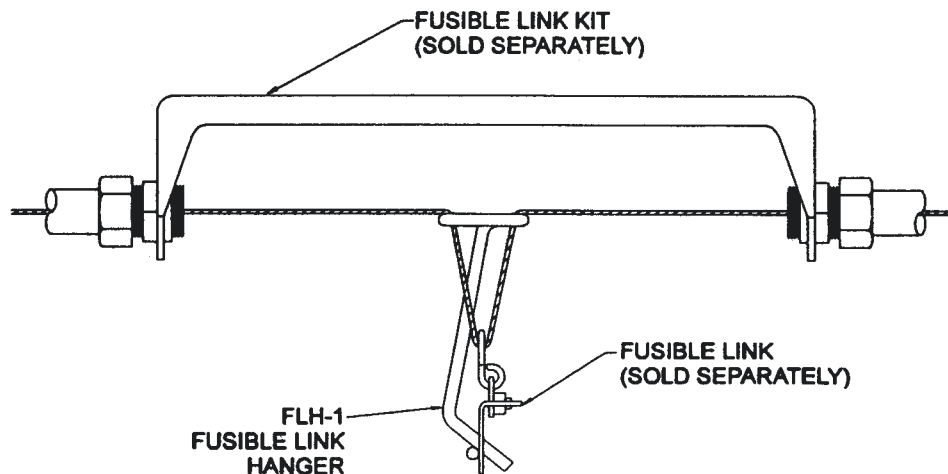


Figure 2-10. Model FLH-1 Fusible Link Hanger

002850PC

4. Fusible Links.

The fusible link is designed to separate at a specific temperature, releasing tension from the fusible link line, causing system actuation. See **Figure 2-11**.

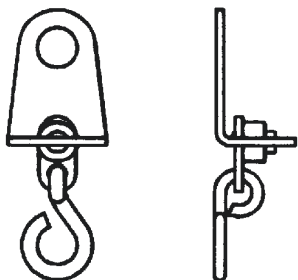


Figure 2-11. ML Style Fusible Link.

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After determining the maximum ambient temperature at the fusible link location, select the correct fusible link according to the temperature condition chart below:

Fusible Link Model No.	Maximum Ambient Temperature	Part Number
FL-165	95° F. (35° C.)	550368
FL-212	142° F. (61° C.)	550365
FL-280	210° F. (99° C.)	550366
FL-360	290° F. (143° C.)	550009
FL-450	380° F. (193° C.)	550367
FL-500	430° F. (221° C.)	56816

5. Thermal Detectors.

Fixed temperature thermal detectors are normally open, mechanical contact closure switches designed to operate at a factory preset temperature. They are available in four preset temperatures which meet NFPA standards and are UL Listed and FM Approved. After determining the maximum ambient temperature at the thermal detector location, select the correct thermal detector according to the temperature condition chart below:

Thermal Detector Model No.	Maximum Ambient Temperature	Part Number
TD-225	155° F. (68° C.)	13976
TD-325	255° F. (124° C.)	13975
TD-450	380° F. (193° C.)	13974
TD-600	530° F. (277° C.)	13971

MODEL RPS-M - REMOTE MECHANICAL PULL STATION (P/N 551074)

Remote manual control for the Model MCH3, NMCH3, or ECH3 control head is provided by the Model RPS-M remote mechanical pull station. It is connected to the system control head by stainless steel cable. This cable is enclosed in 1/2"

EMT with corner pulleys at each change in direction. The remote mechanical pull station shall be located at the point of egress. See **Figure 2-12**.

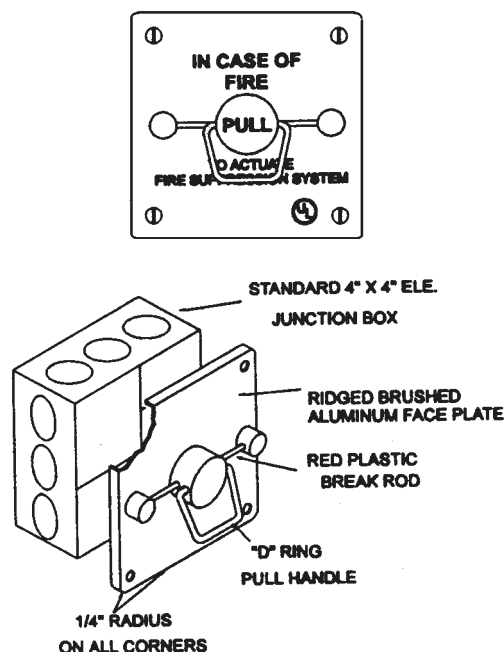


Figure 2-12. Model RPS-M Mechanical Pull Station.

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GAS SHUTOFF VALVES

1. Mechanical Gas Shutoff Valve.

A gas shutoff valve is required on all systems used to protect a gas fueled cooking appliance to stop gas flow in the event of system actuation. A mechanical gas valve can be used with the Model MCH3 control head. It is connected to the system control head by stainless steel cable. This cable is enclosed in 1/2" EMT with a corner pulley at each change in direction. The valves are rated for natural and LP gas (see **Figure 2-13**). Mechanical gas valves are available in the following sizes:

Model No.	Valve Size	Maximum Operating Pressure	Part Number
GV-75	3/4"	5 psi	550593
GV-100	1"	5 psi	550594
GV-125	1-1/4"	5 psi	550595
GV-150	1-1/2"	5 psi	550596
GV-200	2"	5 psi	551049
GV-250	2-1/2"	5 psi	550185
GV-300	3"	5 psi	550186

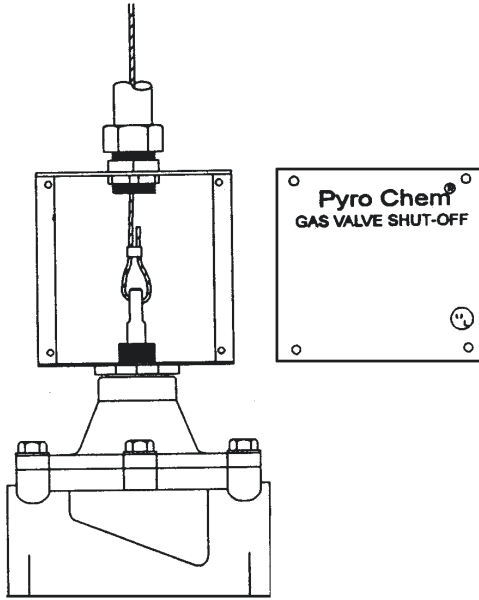


Figure 2-13. GV-Series Mechanical Gas Valve.
002853PC

2. Electric Gas Shutoff Valve.

A gas shutoff valve is required on all systems used to protect a gas fueled cooking appliance to stop gas flow in the event of system actuation. A UL Listed electric gas valve can be used with either the Model MCH3 or ECH3 control head. The valves are rated for natural and LP gas. Valves are available in 120 VAC. Electric gas valves are available in the following sizes:

Model No.	Valve Size	Maximum Operating Pressure	Part Number
EGVSO-75	3/4"	50 psi	550358
EGVSO-100	1"	25 psi	550359
EGVSO-125	1-1/4"	25 psi	550360
EGVSO-150	1-1/2"	25 psi	550361
EGVSO-200	2"	25 psi	550362
EGVSO-250	2-1/2"	25 psi	550363
EGVSO-300	3"	25 psi	550385

Note: A UL Listed manual reset relay is required when using an electric gas valve. The Pyro-Chem Kitchen Knight II Model SM-120 solenoid monitor may be used for this purpose.

CORNER PULLEYS

1. Model SBP-1 (P/N 415670).

A corner pulley is used whenever a change in stainless steel cable direction is required. The Model SBP-1 corner pulley is equipped with a set screw fitting for connection to 1/2" EMT. See **Figure 2-14**.

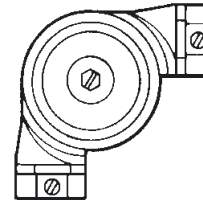


Figure 2-14. Model SBP-1 Corner Pulley.
000160

2. Model CBP-1 (P/N 423250).

A corner pulley is used whenever a change in stainless steel cable direction is required. The Model CBP-1 is a grease-tight corner pulley designed for areas likely to experience excessive deposit build-up. It is equipped with a compression fitting for connection to 1/2" EMT. See **Figure 2-15**.

Note: The Model CBP-1 is not a liquid tight seal for penetration of hoods and/or ducts.

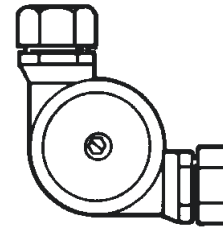


Figure 2-15. Model CBP-1 Corner Pulley.
000161

3. Model WBP-1 (P/N 550982).

A corner pulley is used whenever a change in stainless steel cable direction is required. The Model WBP-1 is a weather-proof corner pulley designed for areas likely to be exposed to moisture. It is equipped with female pipe threads for connection to 1/2" rigid conduit. See **Figure 2-15a**.

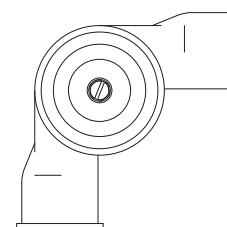


Figure 2-15a. Model WBP-1 Corner Pulley.
000161

TEE PULLEY (P/N 550166)

The Model TP-1 tee pulley is used to connect two mechanical gas valves or two remote mechanical pull stations to a single control head. The tee pulley replaces two standard 90° corner pulleys. See **Figure 2-16**.

CAUTION

The Tee Pulley must never be used to connect multiple fusible link lines to a single control head.

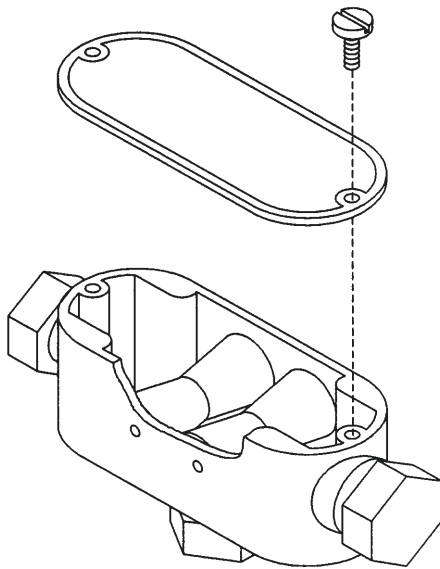


Figure 2-16. Model TP-1 Tee Pulley.

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ELECTRICAL SWITCHES

The electrical switches are intended for use with electric gas valves, alarms, contactors, lights, contractor supplied electric power shut-off devices and other electrical devices that are designed to shut off or turn on when the system is actuated.

NOTE

No electrical connections shall be made inside the control head. All electrical wiring shall exit the control head through the knock-out on the side of the box. All electrical connections must be made in an approved electrical box.

Switches are available in kits: One Switch Kit, Part No. 551154; Two Switch Kit, Part No. 551155; Three Switch Kit, Part No. 551156, and Four Switch Kit, Part No. 551157. Each switch has a set of single-pole, double-throw contacts rated at 21 amp, 1 HP, 125, 250, 277 VAC or 2 HP, 250, 277 VAC. Mounting hardware and 12" wire assemblies are provided with each kit.

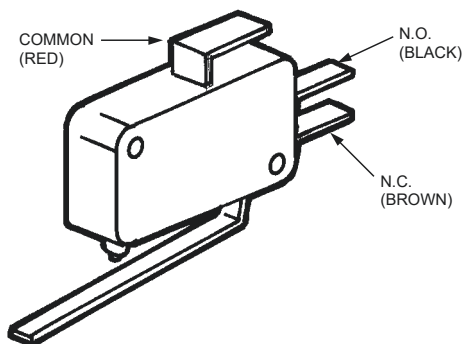


Figure 2-17. Model MS-SPDT Miniature Switch.

001612

MODEL SM-120/24 SOLENOID MONITOR

The Model SM-120/24 solenoid monitor is used in conjunction with the Model ECH3 control head to supervise the actuation and detection circuits. In the event of a problem in the circuit, a light on the monitor goes out. The Model SM-120 is used with the Model ECH3-120 control head. The Model SM-24 (P/N 550303) is used with the Model ECH3-24 control head. Two sets of NO/NC dry contacts are provided. The unit mounts directly to a three gang wall outlet box. The Model SM-120 (P/N 550302) acts as a reset relay when used with an electric gas valve. Electric gas valve wiring instructions are provided in the installation section of this manual. See **Figure 2-18**.

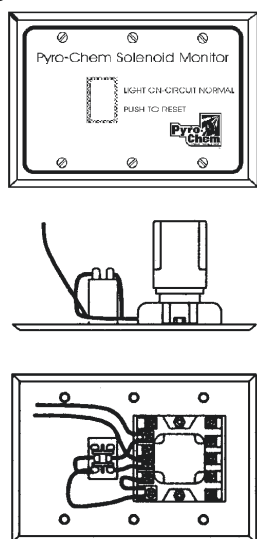


Figure 2-18. Model SM-24/120 Solenoid Monitor.

002860PC

PIPE AND FITTINGS

Pipe and fittings must be furnished by the installer. Schedule 40 stainless steel, chrome plated, or black pipe and fittings must be used. Galvanized pipe and fittings are not to be used.

NOZZLES

Nozzles have been developed for appliance, plenum, and duct applications. All nozzles have a specific flow point value and are supplied with blow-off caps to prevent clogging. Each nozzle is stamped with the model number. See **Figure 2-19**. Application limitations are provided in the design section of this manual.

Part No.	Description	Flow No.
551029	1H Nozzles, pack of ten (10)	1
551026	1L Nozzles, pack of ten (10)	1
551028	2H Nozzles, pack of ten (10)	2
551027	2L Nozzles, pack of ten (10)	2
551038	2D Nozzles, pack of ten (10)	2

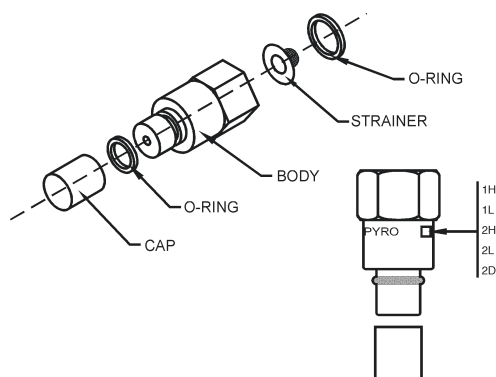


Figure 2-19.

006171PC

SWIVEL ADAPTOR (P/N 423572)

The Swivel adaptor consists of a swivel nut, swivel body, and swivel ball. All are chrome-plated. The swivel adaptor allows the nozzle to be rotated approximately 30° in all directions. Swivel Adaptors must be ordered as a Swivel Adaptor Shipping Assembly, Part No. 423572, which contains 25 swivel adaptors. See **Figure 2-20**.

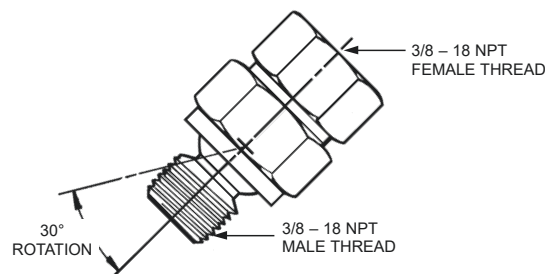


Figure 2-20

000003

COMPONENTS LIST

MODEL NO.	DESCRIPTION	PART NO.	MODEL NO.	DESCRIPTION	PART NO.
PCL-300	3.0 GALLON CYLINDER ASSEMBLY	551194	EGVSO-300	ELECTRIC GAS SHUT-OFF VALVE 3"	550385
PCL-460	4.6 GALLON CYLINDER ASSEMBLY	551193	GV-75	MECHANICAL GAS SHUT-OFF VALVE 3/4"	550593
PCL-600	6.0 GALLON CYLINDER ASSEMBLY	551196	GV-100	MECHANICAL GAS SHUT-OFF VALVE 1"	550594
PAC-10	PNEUMATIC ACTUATING CYLINDER	550104	GV-125	MECHANICAL GAS SHUT-OFF VALVE 1-1/4"	550595
PCL-300	CANADIAN – 3.0 GALLON CYLINDER ASSEMBLY	551195	GV-150	MECHANICAL GAS SHUT-OFF VALVE 1-1/2"	550596
PCL-460	CANADIAN – 4.6 GALLON CYLINDER ASSEMBLY	551192	GV-200	MECHANICAL GAS SHUT-OFF VALVE 2"	551049
PCL-600	CANADIAN – 6.0 GALLON CYLINDER ASSEMBLY	551197	GV-250	MECHANICAL GAS SHUT-OFF VALVE 2-1/2"	550185
PAC-10	CANADIAN – PNEUMATIC ACTUATING CYLINDER	551125	GV-300	MECHANICAL GAS SHUT-OFF VALVE 3"	550186
MB-1	MOUNTING BRACKET (FOR PCL-600)	550053	MS-SPDT	MINI SWITCH - SINGLE POLE DOUBLE THROW	551154
MB-15	MOUNTING BRACKET (FOR PCL-300/460)	550054	MS-DPDT	MINI SWITCH - DOUBLE POLE DOUBLE THROW	551155
MB-P2	MOUNTING BRACKET (FOR MCH3 ECH3-24/120)	550853	MS-3PDT	MINI SWITCH – 3 POLE DOUBLE THROW	551156
MCH3	MECHANICAL CONTROL HEAD	551200	MS-4PDT	MINI SWITCH – 4 POLE DOUBLE THROW	551157
NMCH3	MECHANICAL CONTROL HEAD (NO HANDLE)	551203	CO2-6	6 x CO2 CARTRIDGE	551059
EN-MCU3	ENCLOSURE (FOR PRIMARY CYLINDER)	551208	CBP-1	COMPRESSION BEARING CORNER PULLEY	423250
EN-S	ENCLOSURE (FOR SECONDARY CYLINDER)	550966	SBP- 1	SCREW BEARING CORNER PULLEY	415670
ECH3-24	24VDC ELECTRICAL CONTROL HEAD	551201	WBP-1	WEATHER PROOF BEARING CORNER PULLEY	550982
ECH3-120	120VAC ELECTRICAL CONTROL HEAD	551202	TP-1	TEE PULLEY	550166
1H	WET NOZZLE (PACK OF 10)	551029	- - -	WET VALVE CAP	550831
1L	WET NOZZLE (PACK OF 10)	551026	- - -	CONICAL SPRING (WET VALVE)	550705
2H	WET NOZZLE (PACK OF 10)	551028	- - -	PRESSURE GAGE (WET VALVE)	550713
2L	WET NOZZLE (PACK OF 10)	551027	- - -	PRESSURE REGULATOR ASSEMBLY	550985
2D	WET NOZZLE (PACK OF 10)	551038	- - -	WET VALVE REBUILDING KIT	550698
- - -	SWIVEL ADAPTOR (PACK OF 25)	423572	- - -	PRESSURE REGULATOR REBUILD KIT	551061
RPS-M	REMOTE MECHANICAL PULL STATION	551074	VT-1	VALVE TOOL (WET VALVE)	550788
FLK-1	10 FUSIBLE LINK BRACKET KIT	550131	- - -	NECK O-RING (WET VALVE)	550716
FLK-1A	8 FUSIBLE LINK BRACKET KIT	550132	- - -	PISTON (WET VALVE)	550707
FLH-25	25 x FUSIBLE LINK HANGER	550876	- - -	PISTON O-RING (WET VALVE)	550715
FL-165	FUSIBLE LINK 165°F	550368	- - -	VALVE CAP O-RING (WET VALVE)	550714
FL-212	FUSIBLE LINK 212°F	550365	PCL-300	3.0 GALLON RECHARGE	551188
FL-280	FUSIBLE LINK 280°F	550366	PCL-300T	TEST TANK	551024
FL-360	FUSIBLE LINK 360°F	550009	PCL-460T	TEST TANK	550902
FL-450	FUSIBLE LINK 450°F	550367	PCL-600T	TEST TANK	550901
FL-500	FUSIBLE LINK 500°F	56816	- - -	10 x WET NOZZLE CAP	551528
SM-24	24VDC SOLENOID MONITOR	550303	- - -	10 x WET NOZZLE STRAINER	551529
SM-120	120VAC SOLENOID MONITOR	550302	- - -	10 x WET NOZZLE O-RING	551530
TD-225	THERMAL DETECTOR 225°F	13976	- - -	VALVE STEM O-RING	550028
TD-325	THERMAL DETECTOR 325°F	13975	- - -	COMPLETE WET VALVE ASSEMBLY	551175
TD-450	THERMAL DETECTOR 450°F	13974	PCL-AK	RECHARGE ADAPTOR KIT	551240
TD-600	THERMAL DETECTOR 600°F	13971	- - -	MEASURING STICK	551039
EGVSO-75	ELECTRIC GAS SHUT-OFF VALVE 3/4"	550358	WR-100	CRIMPS (100 PER PACKAGE)	550122
EGVSO-100	ELECTRIC GAS SHUT-OFF VALVE 1"	550359	- - -	FLUSHING SOLUTION (32-OZ.)	79656
EGVSO-125	ELECTRIC GAS SHUT-OFF VALVE 1-1/4"	550360			
EGVSO-150	ELECTRIC GAS SHUT-OFF VALVE 1-1/2"	550361			
EGVSO-200	ELECTRIC GAS SHUT-OFF VALVE 2"	550362			
EGVSO-250	ELECTRIC GAS SHUT-OFF VALVE 2-1/2"	550363			

CHAPTER III SYSTEM DESIGN

This section will cover the proper design of the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. It is divided into three (3) sections:

- Nozzle Coverage and Placement
- Piping Limitations
- Detector Requirements

Each of these sections must be completed before attempting any installation.

NOZZLE COVERAGE AND PLACEMENT

This section will provide guidelines for determining nozzle type, positioning, and quantity for duct, plenum, and appliance protection.

A. Duct Protection

It is not required that the fan be shut down or the exhaust duct be dampered for the system to operate properly. Each nozzle is approved to protect exhaust ducts of unlimited length.

Duct protection requires that a nozzle be positioned to discharge up, into the duct. The nozzle is a Model 2D, Part No. 551038.

The Model 2D duct nozzle is a two (2) flow nozzle. A single 2D nozzle is capable of protecting square or rectangular duct with a maximum of 100 in. perimeter, with the longest side being a maximum of 34 in. It can also protect a round duct with a maximum diameter of 31 7/8 in.

Two (2) Model 2D duct nozzles can protect a square or rectangular duct with a maximum of 150 in. perimeter, with the longest side being a maximum of 51 in. They can also protect a round duct with a maximum diameter of 47 1/2 in.

When two (2) 2D duct nozzles are used to protect a single duct, the cross sectional area of the duct must be divided into two equal symmetrical areas. The nozzle must then be installed on the centerline of the area it protects and aimed directly into the duct opening.

The nozzle(s) must be installed on the centerline of the duct, with the tip located 0 to 6 in. into the opening, and aimed directly into the duct opening. See **Figure 3-1**.

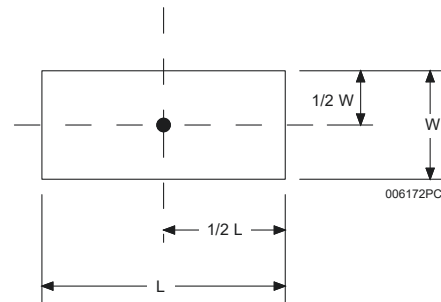
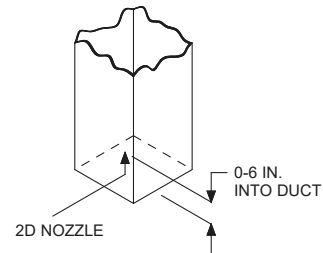


Figure 3-1.

Transition Ducts – The protection of non-standard ducts should be reviewed by the authority having jurisdiction. Pyro-Chem Kitchen Knight II recommends that transition ducts be protected as follows:

- Transition ducts – larger to smaller

In cases where the duct/plenum interface opening is larger than the final exhaust duct, measure the perimeter/diameter of the duct halfway between the largest and smallest section (or the average perimeter/diameter). The nozzle is to be located within 0-6 in. of the duct/plenum interface (not at the point where the measurement was taken), centered under the final exhaust duct opening. See **Figure 3-1a**.

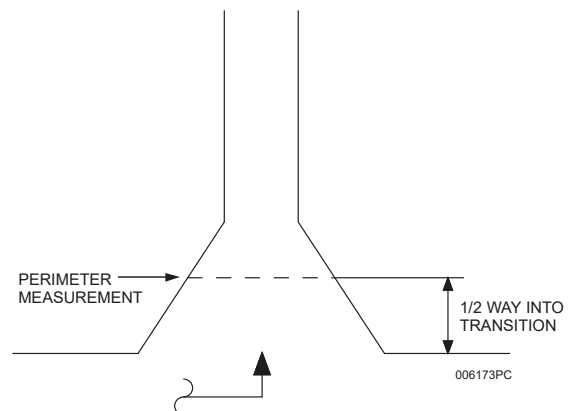


Figure 3-1a.

b. Transition ducts – smaller to larger

In cases where the duct/plenum interface opening is smaller than the final exhaust duct, measure the perimeter/diameter of the final exhaust duct. The nozzle(s) is to be located within 0-6 in. of the duct/plenum interface, centered in the opening. See Figure 3-1b.

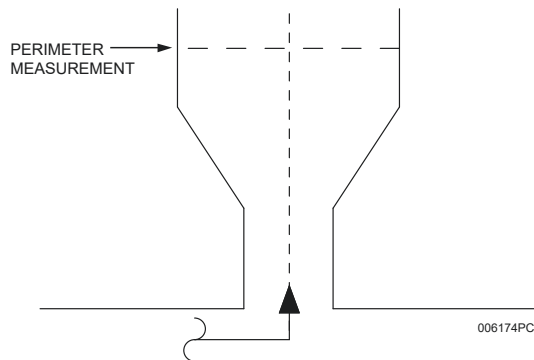


Figure 3-1b

c. Multiple risers

In cases of multiple rises, each riser is protected as an individual duct. See Figure 3-1c.

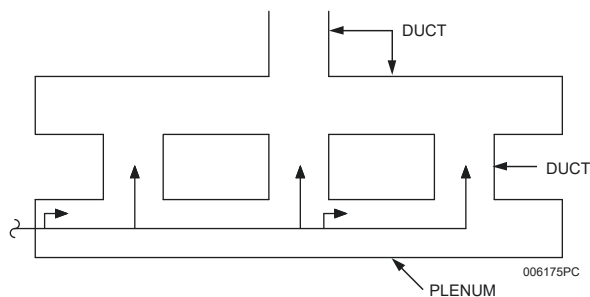


Figure 3-1c

Electrostatic Precipitator – Ducts utilizing electrostatic precipitators must be protected above and below the unit. Standard duct nozzles are used in this application. See Figure 3-1d.

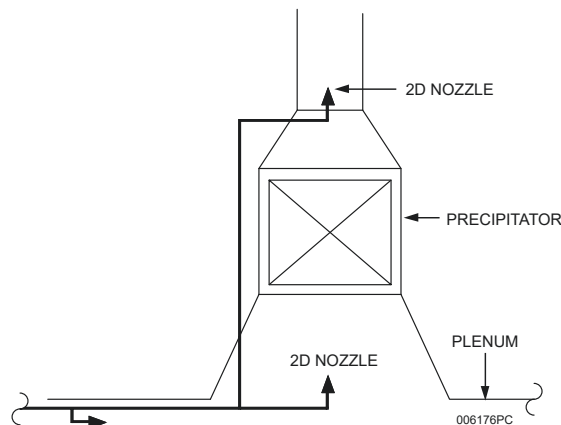


Figure 3-1d

B. Plenum Protection

The Model 1H nozzle, Part No. 551029, is a one (1) flow nozzle used for plenum protection. A single 1H nozzle can protect a plenum (with single or V-bank filters) 10 ft. long by 4 ft. wide. Dividing the length into sections equal to or less than 10 ft. in length and positioning a nozzle at the start of each section can be done to protect longer plenums.

On V-bank plenums, the nozzle(s) must be located at the center of the V-bank width, 1/3 of the vertical height of the filters. On single filter bank plenums, the nozzle must be located 2 in. from the back edge of the filter, 1/3 down from the vertical height. For either application, the nozzle must be located within 6 in. of the end of the plenum (or module) and aimed directly down the length of the plenum. See Figure 3-2.

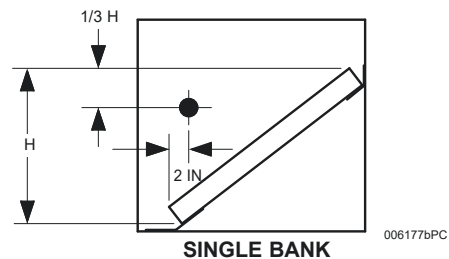
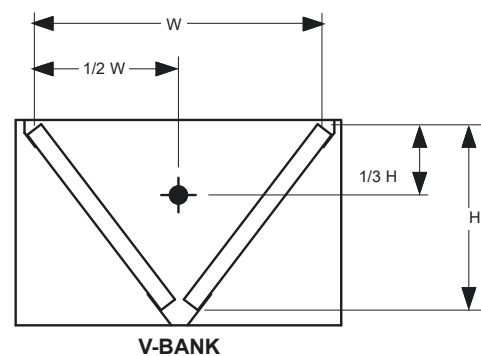
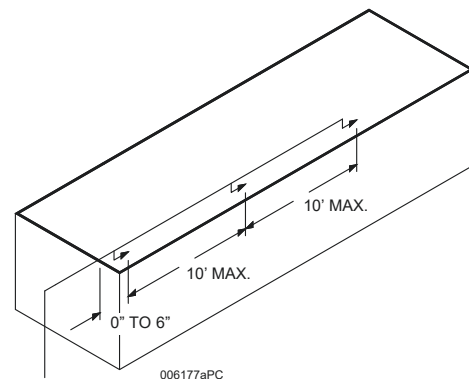


Figure 3-2

C. Appliance Protection

Note: When protecting appliances which are larger than single nozzle coverage, multiple nozzles can be used.

Larger appliances can be divided into several modules, each equal to or smaller than single nozzle coverage. Exception: Fryers must not exceed a maximum of 864 sq. in.

For modularizing fryers, refer to "FRYER – MULTIPLE NOZZLE PROTECTION"

Design Chart

Appliance Type	Maximum Cooking Hazard Area per Nozzle
Fryer Without Drip Board	19 in. x 19 1/2 in. maximum
Fryer With Drip Board	18 in. x 27 3/4 in. maximum 19 in. x 25 3/8 in. maximum
Two Burner Range	12 in. x 28 in. maximum
Four Burner Range	28 in. x 28 in. maximum
Small Wok	24 in. diameter x 6 in. deep maximum
Large Wok	30 in. diameter x 8 in. deep maximum
Small Griddle	Maximum area of 1080 sq. in. with the longest side to be a maximum of 36 in.
Large Griddle	Maximum area of 1440 sq. in. with the longest side to be a maximum of 48 in.
Gas Radiant Char-Broiler	Maximum area of 624 sq. in. with the longest side to be a maximum of 26 in.
Gas Radiant Char-Broiler	Maximum area of 864 sq. in. with the longest side to be a maximum of 36 in.
Lava Rock Char-Broiler	Maximum area of 624 sq. in. with the longest side to be a maximum of 26 in.
Natural Charcoal Broiler	Maximum area of 480 sq. in. with the longest side to be a maximum of 24 in.
Mesquite Char-Broiler	Maximum area of 480 sq. in. with the longest side to be a maximum of 24 in.
Upright/Salamander Broiler	36 in. wide x 28 in. deep maximum
Chain Broiler	27 in. wide x 38 in. deep maximum

1a. Fryers without Drip Board (19 in. x 19 1/2 in. maximum)

Two nozzles are available for fryer protection: High proximity and low proximity.

The Model 2H nozzle, Part No. 551028, is used for high proximity fryer protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 48 in. above the cooking surface of the appliance and aimed at the center of the cooking area. See **Figure 3-3a**.

The Model 2L nozzle is used for low proximity fryer protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard area, 13 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the cooking area. See **Figure 3-3a**.

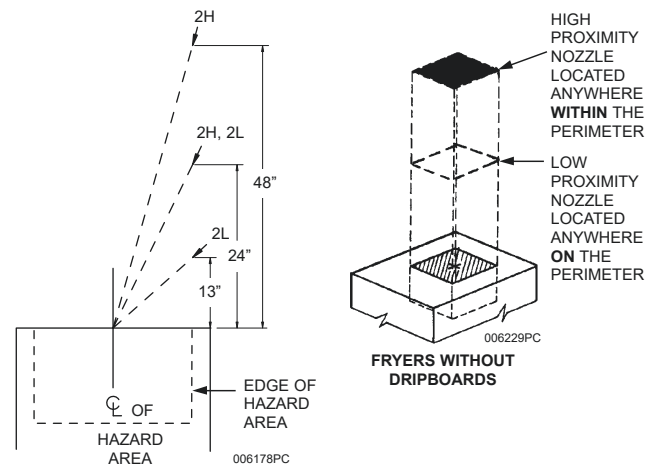


Figure 3-3a

1b. Fryers with Drip Board

The maximum single nozzle protection dimensions depend on the dimensions of the fry pot only.

For fry pots with maximum dimensions of 18 in. on the longest side and 324 sq. in. max. area, use **overall** dimensions of 27 3/4 in. on the longest side and 500 sq. in. max. area.

For fry pots with maximum dimensions exceeding 18 in. x 324 sq. in., but no greater than 19 1/2 in. on the longest side and 371 sq. in. max area, use **overall** dimensions of 25 3/8 in. on the longest side and 495 sq. in. area.

Two nozzles are available for fryer protection: High proximity and low proximity.

The Model 2H nozzle, Part No. 551028, is used for high proximity fryer protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 48 in. above the cooking surface of the appliance and aimed at the center of the cooking area. See **Figure 3-3b**.

The Model 2L nozzle is used for low proximity fryer protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard area, 13 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the cooking area. See **Figure 3-3b**.

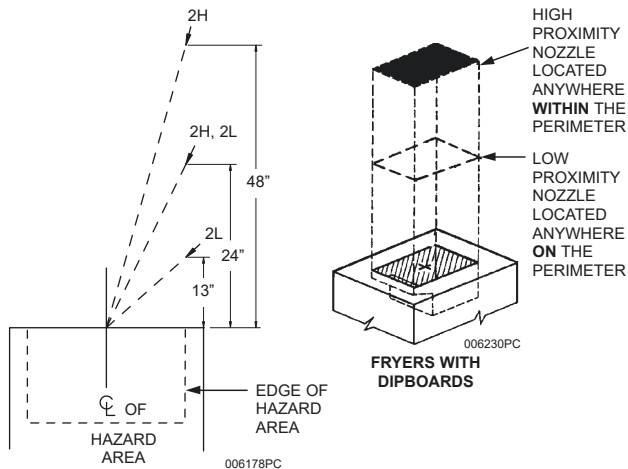


Figure 3-3b

2. Two Burner Range (12 in. x 28 in. maximum)

Two nozzles are available for two burner range protection: High proximity and low proximity.

The Model 1H nozzle, Part No. 551029, is used for high proximity two burner range protection. This nozzle is a one (1) flow nozzle. **When using high proximity protection, the range cannot be under a backshelf.** This nozzle must be located on both the front/back centerline and the side/side centerline of the appliance, 40 in. to 50 in. above the cooking surface, and aimed directly down. See **Figure 3-4a**.

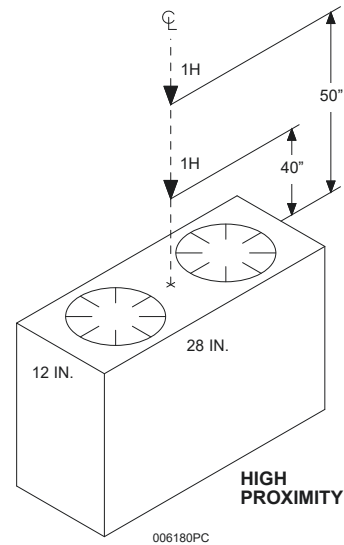


Figure 3-4a

The Model 1L nozzle, Part No. 551066, is used for low proximity two burner range protection. This nozzle is a one (1) flow nozzle. The range can be equipped either with or without a backshelf. Either type requires the same nozzle requirements. The nozzle must be located 22 in. from the end of the hazard area centered from left to right. It must be 13 in. to 24 in. above cooking surface, and aimed at a point one half the distance of whatever the height dimension of the nozzle is. When determining nozzle and aim point locations, both measurements are to be taken from the **same** end of the hazard area. Example: The nozzle is mounted 20 in. above the cooking surface. The aim point from the edge of the hazard would then be 10 in. which is one half the nozzle mounting height dimension. See **Figure 3-4b**. Note: If the range contains a backshelf, it must be a minimum of 23 1/2 in. above the surface of the appliance and cannot extend over the hazard area more than 11 in.

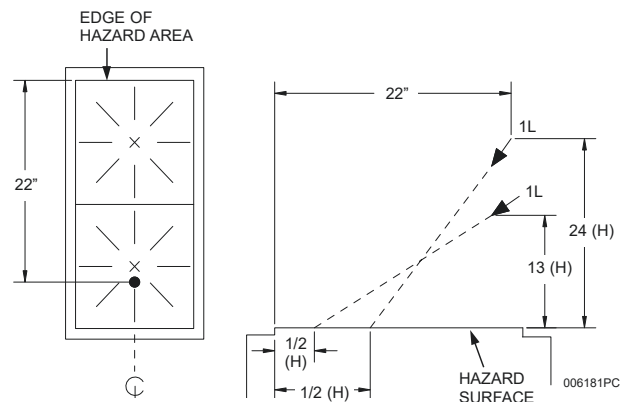
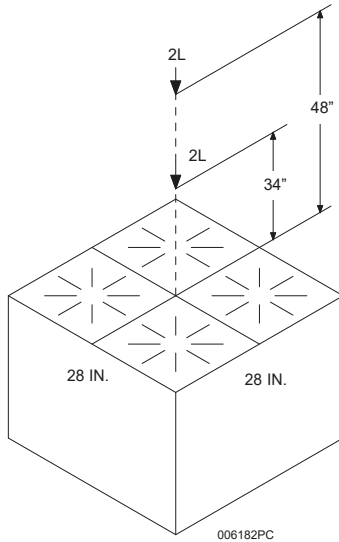


Figure 3-4b

3. Four Burner Range (28 in. x 28 in. maximum)

One nozzle is available for four burner range protection: High proximity.

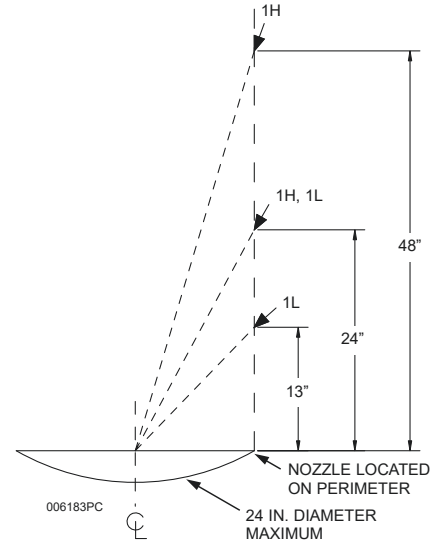
The Model 2L nozzle, Part No. 551027, is used for high proximity four burner range protection. This nozzle is a two (2) flow nozzle. **When using high proximity protection, the range cannot be under a backshelf.** This nozzle must be located on both the front/back centerline and the side/side centerline of the hazard area, 34 in. to 48 in. above the cooking surface, and aimed directly down. See **Figure 3-5**.

**Figure 3-5****4. Small Wok (24 in. diameter x 6 in. depth maximum)**

Two nozzles are available for small wok protection: High proximity and low proximity.

The 1H nozzle, Part No. 551029, is used for high proximity wok protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the appliance, 24 in. to 48 in. above the top edge of the wok and aimed at the center of the wok. See **Figure 3-6**.

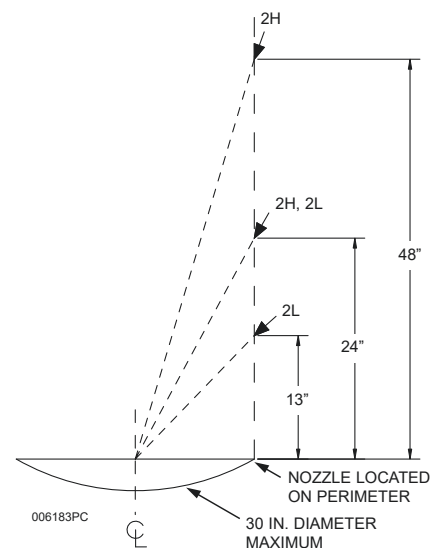
The 1L nozzle, Part No. 551026, is used for low proximity wok protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the appliance, 13 in. to 24 in. above the top edge of the wok and aimed at the center of the wok. See **Figure 3-6**.

**Figure 3-6****5. Large Wok (Greater than 24 in. to 30 in. diameter x 8 in. depth maximum)**

Two nozzles are available for large wok protection: High proximity and low proximity.

The 2H nozzle, Part No. 551028, is used for high proximity wok protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the appliance, 24 in. to 48 in. above the top edge of the wok and aimed at the center of the wok. See **Figure 3-7**.

The 2L nozzle, Part No. 551027, is used for low proximity wok protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the appliance, 13 in. to 24 in. above the top edge of the wok and aimed at the center of the wok. See **Figure 3-7**.

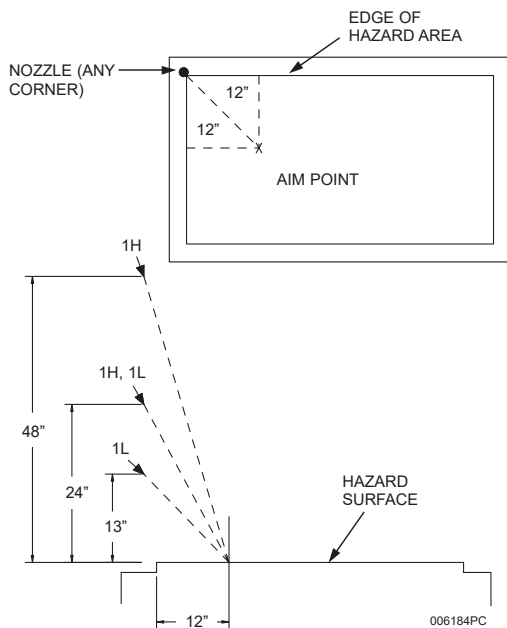
**Figure 3-7**

6. Small Griddle (1080 sq. in. x 36 in. longest side maximum)

Two nozzles are available for small griddle protection: High proximity and low proximity.

The 1H nozzle, Part No. 551029, is used for high proximity griddle protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **above any corner** of the hazard surface, 24 in. to 48 in. above the cooking surface of the appliance and aimed at a point 12 in. over and 12 in. in from the corner below the nozzle. See **Figure 3-8**.

The 1L nozzle, Part No. 551026, is used for low proximity griddle protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **above any corner** of the hazard surface, 13 in. to 24 in. above the cooking surface of the appliance and aimed at a point 12 in. over and 12 in. in from the corner below the nozzle. See **Figure 3-8**.

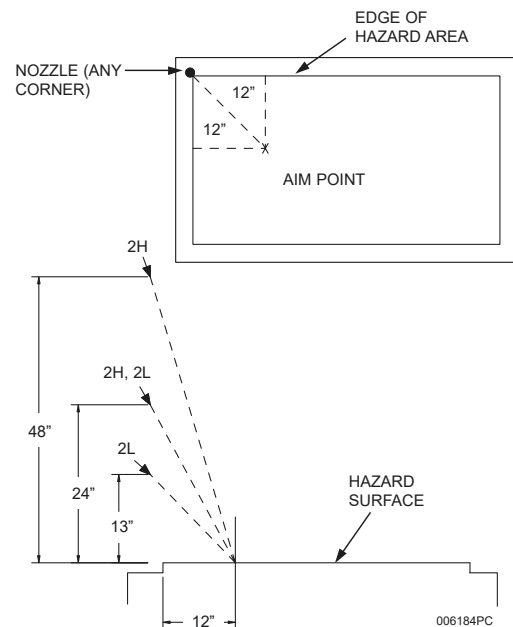
**Figure 3-8****7. Large Griddle** (1440 sq. in. x 48 in. longest side maximum)

Two nozzles are available for large griddle protection: High proximity and low proximity.

The 2H nozzle, Part No. 551028, is used for high proximity griddle protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **above any corner** of the hazard surface, 24 in. to 48 in. above the cooking surface of the appliance and aimed at a point 12 in. over and 12 in. in from the corner below the nozzle. See **Figure 3-9**.

The 2L nozzle, Part No. 551027, is used for low proximity griddle protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **above any corner** of the hazard surface, 13 in. to 24 in. above the cooking surface of the appliance and aimed at a point 12 in. over

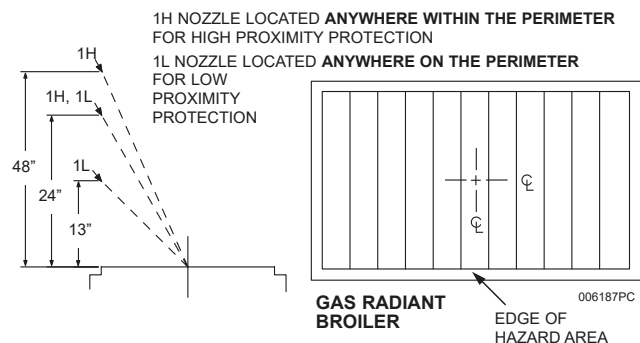
and 12 in. in from the corner below the nozzle. See **Figure 3-9**.

**Figure 3-9****8. Gas Radiant Char-Broiler** (624 sq. in. x 26 in. longest side maximum)

Two nozzles are available for gas radiant char-broiler protection: High proximity and low proximity.

The 1H nozzle, Part No. 551029, is used for high proximity gas radiant char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 48 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-10**.

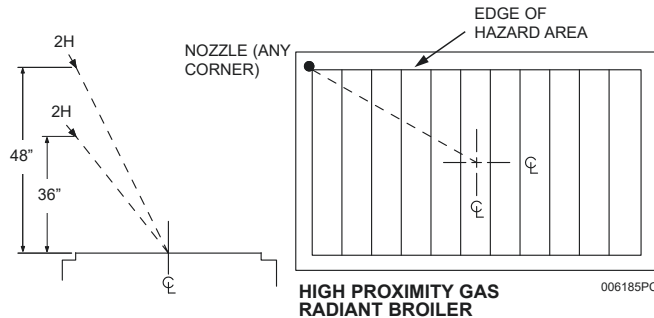
The 1L nozzle, Part No. 551026, is used for low proximity gas radiant char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard surface, 13 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-10**.

**Figure 3-10**

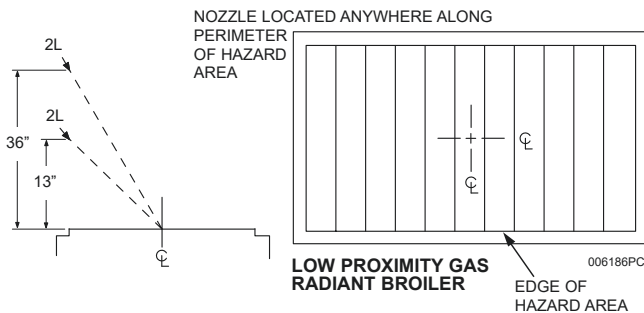
9. Gas Radiant Char-Broiler (864 sq. in. x 36 in. longest side maximum)

Two nozzles are available for gas radiant char-broiler protection: High proximity and low proximity.

The 2H nozzle, Part No. 551028, is used for high proximity gas radiant char-broiler protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **above any corner** of the hazard surface, 36 in. to 48 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-11a**.

**Figure 3-11a**

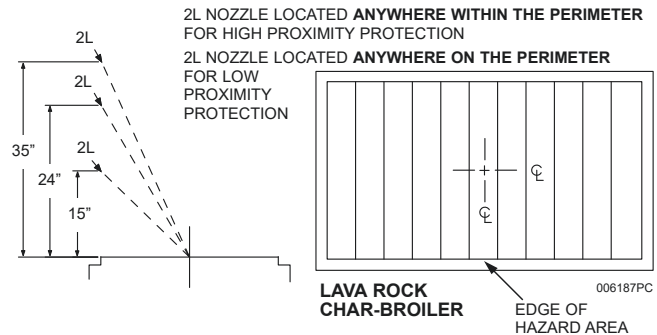
The 2L nozzle, Part No. 551027, is used for low proximity gas radiant char-broiler protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard surface, 13 in. to 36 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-11b**.

**Figure 3-11b****10. Lava Rock Char-Broiler** (624 sq. in. x 26 in. longest side maximum)

One nozzle is available for lava rock char-broiler protection. The 2L nozzle, Part No. 551027, is used for both high proximity and low proximity.

The 2L nozzle, Part No. 551027, is used for high proximity lava rock char-broiler protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 35 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-12**.

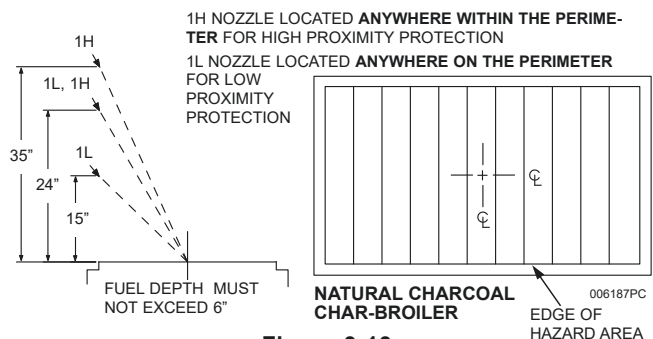
The 2L nozzle, Part No. 551027, is used for low proximity lava rock char-broiler protection. This nozzle is a two (2) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard surface, 15 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-12**.

**Figure 3-12****11. Natural Charcoal Char-Broiler** (480 sq. in. x 24 in. longest side maximum)

Two nozzles are available for natural charcoal char-broiler protection. High proximity and low proximity. The maximum depth of fuel (charcoal) must not exceed 6 in.

The 1H nozzle, Part No. 551029, is used for high proximity natural charcoal char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 35 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-13**.

The 1L nozzle, Part No. 551026, is used for low proximity natural charcoal char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard surface, 15 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-13**.

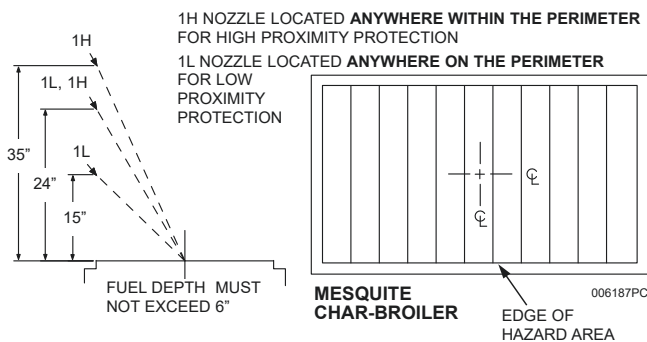
**Figure 3-13**

12. Mesquite Char-Broiler (480 sq. in. x 24 in. longest side maximum)

Two nozzles are available for mesquite char-broiler protection. High proximity and low proximity. The maximum depth of fuel (wood) must not exceed 6 in.

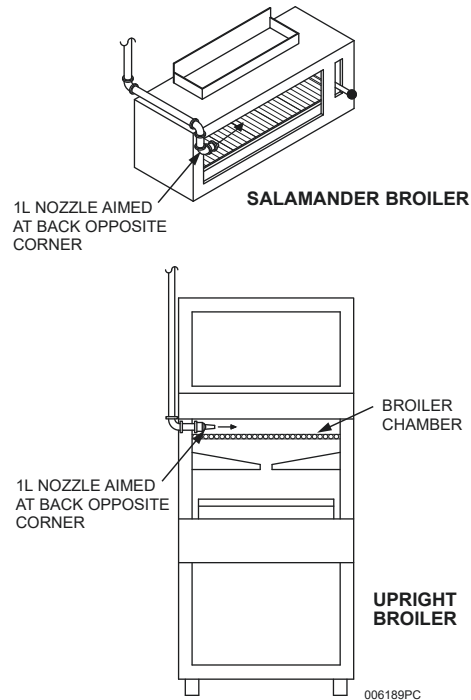
The 1H nozzle, Part No. 551029, is used for high proximity mesquite char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere within the perimeter** of the hazard area, 24 in. to 35 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-14**.

The 1L nozzle, Part No. 551026, is used for low proximity mesquite charcoal char-broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located **anywhere on the perimeter** of the hazard surface, 15 in. to 24 in. above the cooking surface of the appliance and aimed at the center of the broiler surface. See **Figure 3-14**.

**Figure 3-14****13. Upright/Salamander Broiler** (internal chamber 36 in. wide x 28 in. deep maximum)

One nozzle is available for upright/salamander broiler protection.

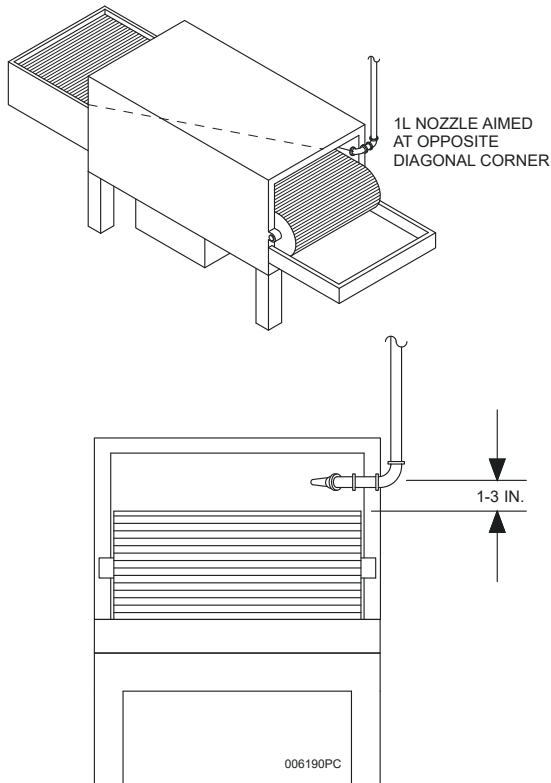
The 1L nozzle, Part No. 551026, is used for broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located above the grate, at the front edge of the appliance, and pointed at the back opposite corner of the broiler chamber. The nozzle must be aimed parallel to the broiler grate surface. See **Figure 3-15**.

**Figure 3-15**

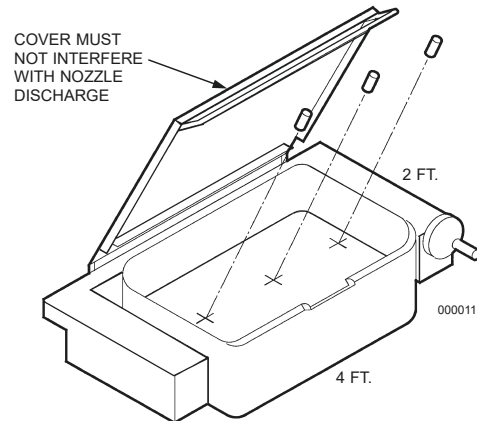
14. Chain Broiler (internal chamber 27 in. wide x 38 in. deep maximum)

One nozzle is available for chain broiler protection.

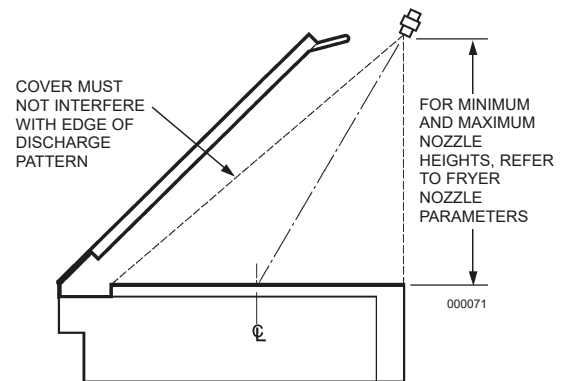
The 1L nozzle, Part No. 551026, is used for broiler protection. This nozzle is a one (1) flow nozzle. The nozzle must be located 1-3 in. above the surface of the chain, at the front edge of the appliance, and pointed at the opposite diagonal corner. The nozzle must be aimed parallel to the chain surface. See **Figure 3-16**.

**Figure 3-16****15. Tilt Skillet/Braising Pan**

Protection for tilt skillet or braising pans is to be based upon the coverage limitations provided for deep fat fryer protection. Coverage limitations are based on fryer sizes including drip boards. Exception: Tilt skillets and braising pans may exceed the maximum of 6 sq. ft. total when modularizing. Tilt skillets and braising pans generally utilize a hinged cover. Fryer protection nozzles are to be placed toward the front of the appliance to minimize the potential for the tilt skillet or braising pan cover to interfere with the nozzle discharge. See **Figure 3-17**.



THE NOZZLE IS TO BE PLACED TOWARD THE FRONT OF THE APPLIANCE TO MINIMIZE THE POTENTIAL FOR THE SKILLET OR BRAISING PAN COVER TO INTERFERE WITH THE NOZZLE DISCHARGE.



FRYER NOZZLE USED FOR TILT SKILLET OR BRAISING PAN PROTECTION MUST BE POSITIONED NEAR THE FRONT EDGE OF THE PAN AND AIMED AT THE FRONT TO BACK CENTERLINE OF THE PAN. THE DISCHARGE FROM THE NOZZLE(S) MUST COMPLETELY CLEAR THE PAN COVER WITH AN UNOBSTRUCTED VIEW TO THE BACK OF THE PAN.

Figure 3-17

FRYER – MULTIPLE NOZZLE PROTECTION

Fryers exceeding the coverage of a single nozzle can be divided into modules. Each module must not exceed the maximum area allowed for a single nozzle. However, when utilizing multiple nozzle protection, the longest side allowed for a fryer with drip board can be used, regardless of whether the fryer has a drip board or not.

The maximum size fryer that can be modularized is 864 sq. in.

Design requirements for multiple nozzle fryers are broken down as follows:

1. If the fryer includes any dripboard areas, measure both the internal length (front to back) and width of the frypot portion. Then measure the internal length and width of the overall hazard area including any dripboard areas.

Determine the area of both the frypot and the area of the overall vat by multiplying corresponding length and width dimensions.

2. Divide the frypot or overall vat into modules, each of which can be protected by a single nozzle, based on the maximum dimension and area coverage of the nozzle as specified in "Design Chart."
 - If the module considered does not include any portion of the dripboard, use only the maximum frypot area and maximum dimension listed in the "Design Chart."
 - If the module considered includes any dripboard areas, use both the maximum frypot area and dimension listed in the "Design Chart", and the maximum overall area and dimension listed in the "Design Chart."
3. None of the maximum dimensions may be exceeded. If either the maximum frypot or the overall sizes are exceeded, the area divided into modules will need to be redefined with the possibility of an additional nozzle.

PIPING LIMITATIONS

Once the nozzle placement and quantity of tanks has been determined, it is necessary to determine the piping configurations between the tank and the nozzles. This section contains the guidelines and limitations for designing the distribution piping so that the wet chemical agent will discharge from the nozzles at a proper flow rate. These limitations must also be referred to when selecting the mounting location for the tanks.

The maximum pipe lengths are based on internal pipe volume. Each size tank is allowed a minimum and maximum total volume of piping, calculated in milliliters.

There is no need to distinguish between what portion of the piping is supply line and what portion is branch line. Only the total volume of the complete piping network has to be considered.

Volume Chart

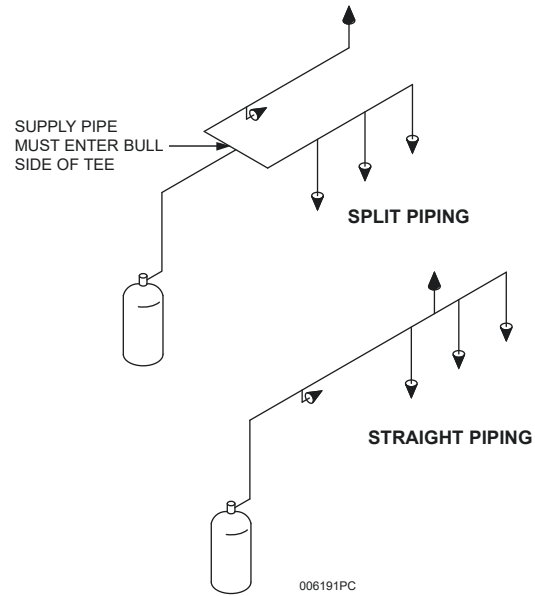
1/4 in. pipe = 20.5 mls./ft.
3/8 in. pipe = 37.5 mls./ft.
1/2 in. pipe = 59.8 mls./ft.
3/4 in. pipe = 105.0 mls./ft.

Tank Chart

Tank Size	Maximum Flow Numbers	Maximum Pipe Volume (milliliters)	Maximum Volume Allowed Between First Nozzle and Last Nozzle (milliliters)
3.0 Gallon PCL-300	10	1910	1125
4.6 Gallon PCL-460	14	3400	3000
4.6 Gallon PCL-460	15	2600	2000
6.0 Gallon PCL-600	19	4215	1688 per side
6.0 Gallon PCL-600	20	3465	1313 per side

General Piping Requirements

1. Split piping and straight piping are both allowed on a PCL-300 and PCL-460 system.
2. PCL-600 systems must use split piping only, with no nozzle located before the split, and with a maximum of 14 flow points per side. 1/2 in. minimum piping must be used up to the first split.
3. Maximum volume for 1/4 in. pipe between a nozzle and the preceding tee is 410 mls.
4. Maximum flow numbers for 1/4 in. pipe is 6.
5. Maximum number of elbows between a nozzle and the preceding tee is 5.
6. Maximum of 25 elbows are allowed in the total piping system.
7. Maximum difference in elevation between the tank outlet and any nozzle, or the tank outlet and the highest or lowest horizontal pipe run, is 10 ft.
8. No traps are allowed in the piping network.
9. Pipe lengths are measured from center to center of fittings.
10. The internal equivalent length volume of fittings does not have to be considered as part of the total pipe volume.
11. When utilizing different size pipe in the system, the largest size must start first and the additional pipe must decrease as it approaches the nozzle.
12. Elbow(s) or swivel adaptors located at the nozzles do not have to be counted in the 25 elbow maximum requirement.
13. Reducing bushings are allowed when reducing to a smaller pipe size.
14. Additional piping requirements when protecting a range, wok, or a fryer:
 - PCL-300 - Minimum of 300 ml and four (4) flow numbers required in total system. Of that minimum, 239 ml and two (2) flow numbers must be utilized at or before the range, wok, or fryer.
 - PCL-460 – Minimum of 660 ml and ten (10) flow numbers required in total system. Of that minimum, 180 ml and two (2) flow numbers must be utilized at or before the range, wok, or fryer.
 - PCL-600 – Minimum of 960 ml and fourteen (14) flow numbers required in total system. Of that minimum, 120 ml and 2 flow numbers must be utilized at or before the range, wok, or fryer.

**Figure 3-18****Design Steps**

- Step No. 1** Determine number of flow points required based on duct size, plenum size and type, and size of all appliances.
- Step No. 2** Determine size and quantity of tanks required. Refer to the chart in "General Piping Requirements" to determine the maximum amount of flow numbers allowed per each tank size.
- Step No. 3** Layout nozzles, piping diagram, and tank location. Determine pipe lengths as accurate as possible. Make certain maximum number of elbows is not exceeded. **Note: Tanks cannot be manifolded together. Each tank must have a separate piping network.**
- Step No. 4** Add all the lengths of each pipe run and multiply by the mls./ft. listed in the Volume Chart. If the sum falls within the acceptable range noted in general Piping Requirements, that pipe size is acceptable. If the calculated volume is too large, recalculate the volume using the ml per foot of a smaller pipe size. Pipe sizes can be mixed but Rule No. 11 of the General Piping Requirements must be followed.
- Step No. 5** Check to make certain minimum volumes, maximum volumes and maximum volume allowed between first nozzle and last nozzle is not exceeded (Tank Chart). Check each rule in "General Piping Requirement" to make certain none have been exceeded. If any requirement is exceeded, change to a different pipe size and recalculate.

The cooking area that requires protection consists of a single 48 in. perimeter exhaust duct, a 10 ft. long "V" bank plenum, (2) 18 in. wide x 24 in. fryers, a 30 in. x 36 in. wide griddle, and a 24 in. diameter wok. See **Figure 3-19**.

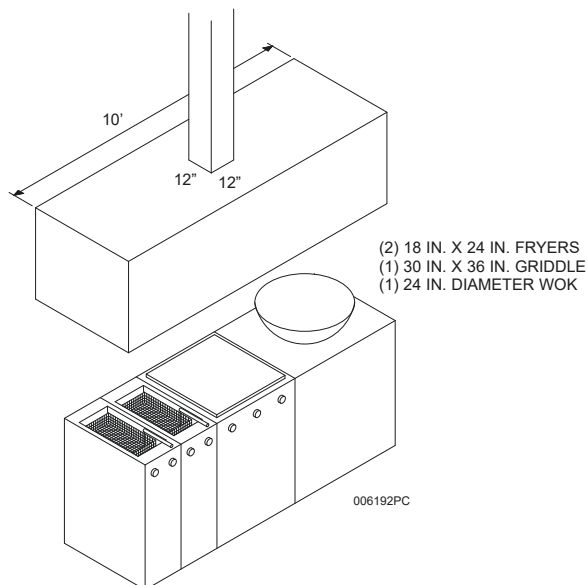


Figure 3-19

- 48 in. perimeter duct requires one, **two flow** nozzle
- 10 ft. "V" bank hood requires one, **one flow** nozzle
- 18 in. x 24 in. fryer requires one, **two flow** nozzle
- 18 in. x 24 in. fryer requires one, **two flow** nozzle
- 30 in. x 36 in. griddle requires one, **one flow** nozzle
- 24 in. diameter wok requires one, **one flow** nozzle

TOTAL FLOW NUMBERS – 9

Step No. 2 Determine size and quantity of tanks required. Referring to the chart in "General Piping Requirements", a PCL-300 and a PCL-460 can supply 10 flows, therefore, a PCL-300 can be utilized.

Step No. 3 Make an accurate sketch of the cooking lineup and the hood. Sketch in the tank location and all the piping required for the total system. Make certain all pipe lengths and number of elbows are as accurate as possible. Check the "General Piping Requirements" to determine that the minimum and maximum requirements are met. See **Figure 3-20**.

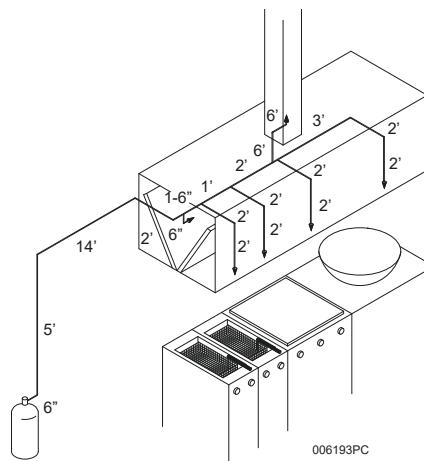


Figure 3-20

Step No. 4 Total all pipe lengths. Refer to the Volume Chart. Chose a given pipe size and multiply the ml per foot by the total length of all the pipe. If the sum falls within the acceptable range noted in Tank Chart, that pipe size is acceptable. If the calculated volume is too large, recalculate the volume using the ml per foot of a smaller pipe size. See **Figure 3-21**.

Add section A-B = $0'-6" + 5' + 14' + 2' + 0'-6" = 22'$

Add section B-C = $1'-6"$

Add section C-D = $1'$

Add section D-E = $2'$

Add section E-F = $0'-6"$

Add section F-L = $3' + 2' + 2' = 7'$

Add section B-G = $0'-6"$

Add section C-H = $2' + 2' = 4'$

Add section D-I = $2' + 2' = 4'$

Add section E-J = $0'-6" + 0'-6" = 1'$

Add section F-K = $2' + 2' = 4'$

Total length of all pipe = $47'-6"$

Refer to Volume Chart. The pipe size chosen is 3/8 inch. The volume per foot of 3/8 in. pipe is 37.5 ml. Multiply 37.5 by the total pipe length of 47.5 ft.

$37.5 \text{ ml} \times 47.5 \text{ ft.} = 1781 \text{ ml total volume}$

The maximum volume allowed for a PCL-300 is 1910 ml, therefore, 3/8 in. pipe is acceptable for this system.

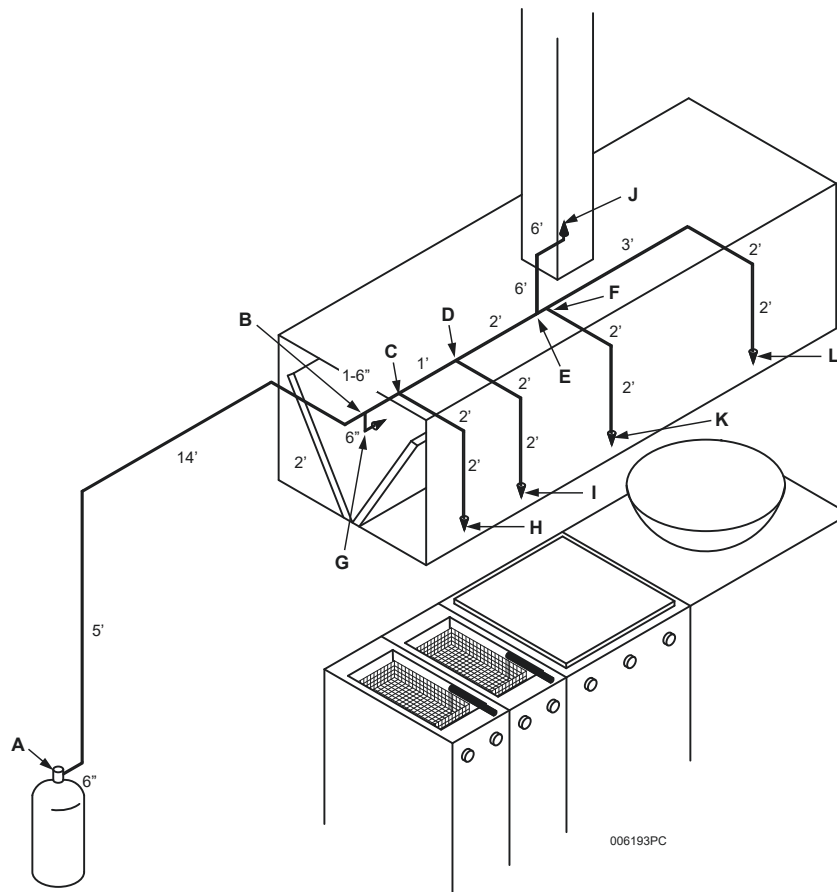


Figure 3-21

- Step No. 5** Check to make certain minimum volumes and maximum volume allowed between first nozzle and last nozzle are not exceeded (Tank Chart). Check each rule in "General Piping Requirements" to make certain none have been exceeded. If any requirement is exceeded, change to a different pipe size and recalculate. See **Figure 3-22**.

Refer to Tank Chart

Minimum Pipe Volume for PCL-300 is 300 milliliters protecting a fryer, wok, or range
(Example system pipe volume is 1781 milliliters, therefore OK)

Maximum Pipe Volume for PCL-300 is 1910 milliliters (Example system pipe volume is 1781 milliliters, therefore OK)

Maximum Volume Allowed Between First Nozzle and Last Nozzle for PCL-300 is 1125 milliliters (Example system, the amount of 3/8 in. piping between G and L, is 25.5 feet. 25.5 feet x 37.5 mls./ft. = 956.3 ml, therefore, OK)

Refer to General Piping Requirements

1. Split piping and straight piping are both allowed on PCL-300 and PCL-460 systems. (Example system OK)
2. PCL-600 systems must use split piping only, with no nozzle located before the split, and with a maximum of 14 flow points per side. 1/2 in. minimum piping must be used up to the first split. (Example system N/A)
3. Maximum volume for 1/4 in. pipe between a nozzle and the preceding tee is 410 mls. (Example system N/A)
4. Maximum flow numbers for 1/4 in. pipe is 6. (Example system N/A)
5. Maximum number of elbows between a nozzle and the preceding tee is 5. (Example system has a maximum number of 2, therefore, OK)
6. Maximum of 25 elbows are allowed in the total piping system. (Example system has 11 elbows, therefore, OK)
7. Maximum difference in elevation between the tank outlet and any nozzle, or the tank outlet and the highest or lowest horizontal pipe run, is 10 ft. (Example system has 5'-6", therefore, OK)
8. No traps are allowed in the piping network. (Example system has no traps, therefore, OK)
9. Pipe lengths are measured from center to center of fittings. (Example system pipe lengths were measured from center to center of fittings, therefore, OK)
10. The internal equivalent length volume of fittings does not have to be considered as part of the total pipe volume. (Example system OK)
11. When utilizing different size pipe in the total system, the largest size must start first and the additional pipe must decrease as it approaches the nozzle. (Example system N/A)
12. Elbow(s) or swivel adaptors located at the nozzles do not have to be counted in the 25 elbow maximum requirement. (Example system OK)
13. Additional piping requirements when protecting a range, wok, or a fryer:
 - PCL-300 - Minimum of 300 ml and four (4) flow numbers required in total system. Of that minimum, 239 ml and two (2) flow numbers must be utilized at or before the range, wok, or fryer. (Example system has 1781 ml and 10 flow numbers, therefore, OK. The example system has 1050 ml and 3 flows before the fryer, therefore, OK)
 - PCL-460 – Minimum of 660 ml and ten (10) flow numbers required in total system. Of that minimum, 180 ml and two (2) flow numbers must be utilized at or before the range, wok, or fryer.
 - PCL-600 – Minimum of 960 ml and fourteen (14) flow numbers required in total system. Of that minimum, 120 ml and 2 flow numbers must be utilized at or before the range, wok, or fryer.

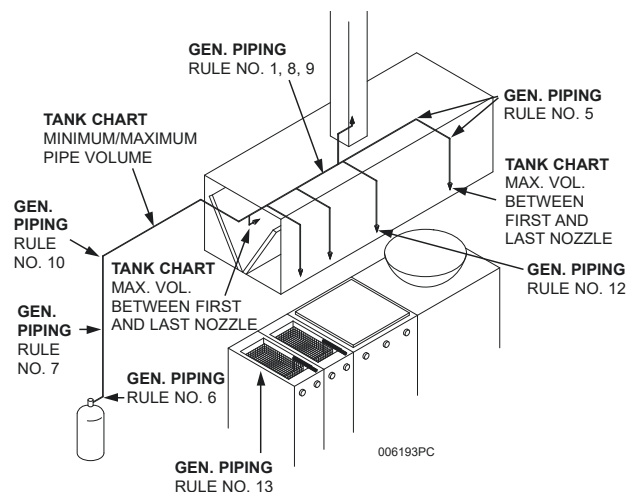


Figure 3-22

DETECTOR PLACEMENT

Detectors are required over cooking appliances and in the duct(s) of protected ventilation hoods. Detectors shall be located in the plenum area of the ventilation hood.

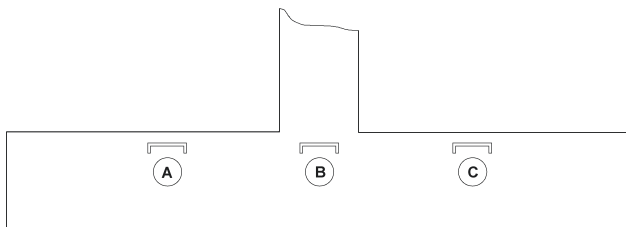
1. Exhaust Duct(s).

Each exhaust duct must have at least one (1) detector installed in the duct entrance, located in the air stream of the cooking vapors at a maximum of 12 feet into the duct, centered. See **Figure 3-25**.

2. Cooking Appliance(s).

Each cooking appliance with a continuous cooking surface not exceeding 48" x 48" shall be protected by one (1) detector. Cooking appliances with a continuous cooking surface exceeding 48" x 48" shall be protected by one (1) detector per 48" x 48" cooking area. Detectors used for cooking appliances must be located within the perimeter of the protected appliance toward the exhaust duct side of the appliance. The detector should be located in the air stream of the appliance to enhance system response time.

If a cooking appliance is located under a duct opening where a detector has been mounted, it is not necessary to utilize an additional detector provided the duct detector is not more than 12" into the duct opening. If two (2) appliances are located under a duct opening where a detector has been mounted, it is not necessary to utilize an additional detector provided the duct detector is not more than 12" into the duct opening. See **Figure 3-23**.



APPLIANCE COVERED BY DETECTOR A	APPLIANCE COVERED BY DETECTOR B	APPLIANCE COVERED BY DETECTOR B	APPLIANCE COVERED BY DETECTOR C
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Figure 3-23. Proper Detector Placement.

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NOTES:

CHAPTER IV SYSTEM INSTALLATION

GENERAL

This chapter will detail the basic information necessary for proper installation of the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. However, before attempting any installation it is necessary to attend a Factory Certification Training Class and become Certified to install the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. Because it is difficult to completely understand every aspect of an intricate pre-engineered system simply by reading the Technical Manual, Pyro-Chem Kitchen Knight II will not be responsible for system installations or maintenance performed by any non-Certified person(s).

Pipe and fittings for the discharge piping, conduit (EMT), pipe straps, pipe hangers, mounting bolts, and other miscellaneous equipment are not furnished as part of the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. These items must be furnished by the installer.

Before attempting any installation, unpack the entire system and check that all necessary parts are on hand. Inspect parts for damage. Verify that cylinder pressure is within the acceptable range as shown on the gauge.

CYLINDER INSTALLATION

The cylinder and valve assembly is shipped with an anti-recoil plug in the valve discharge port.

CAUTION

The anti-recoil plug must remain in the valve discharge port until the discharge piping is connected to the valve.

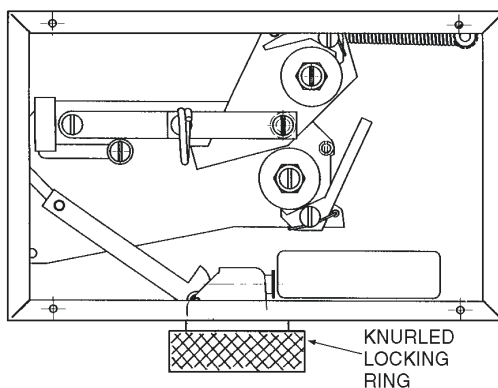


Figure 4-2. Single Cylinder Installation Using Model ECH3/MCH3/NMCH3 Control Head.

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The cylinder must be mounted vertically. The Models PCL-300 and PCL-460 cylinders must be mounted using a Model MB-15 Mounting Bracket Kit. The Model PCL-600 cylinder must be mounted using a Model MB-1 Mounting Bracket Kit.

The bracket must be securely anchored to the wall using bolts or lag screws. The wall to which the bracket is attached must be sufficiently strong to support the cylinder. The bracket should never be fastened to dry wall or similar material. If this type of wall is encountered, studs must be located and the bracket fastened to them. See **Figure 4-1**.

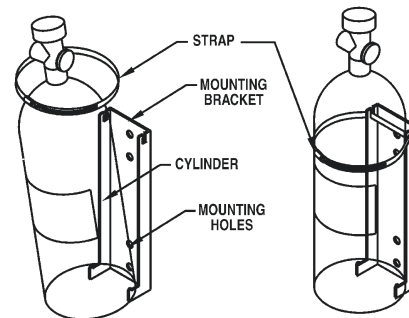


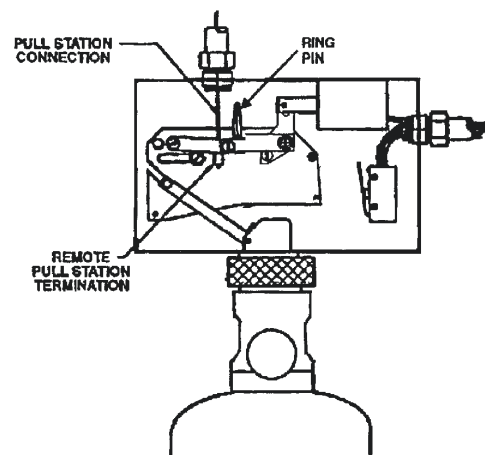
Figure 4-1. Cylinder and Mounting Bracket Installation.

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CONTROL HEAD INSTALLATION

1. Single Cylinder Installations.

For single cylinder system installations the Model MCH3/ECH3/NMCH3 Control Head can be installed directly onto the cylinder valve. When the control head is properly aligned in the desired position, tighten the knurled locking ring to secure the assembly. See **Figure 4-2**.



2. Multiple Cylinder Installations.

A. Multiple Cylinder Actuation Using MCH3/ECH3/NMCH3 Control Head.

The Model MCH3/ECH3/NMCH3 Control Head can be used to pneumatically actuate a maximum of three (3) agent cylinders. When a control head is used for multiple cylinder actuation, it cannot be mounted directly onto a cylinder valve. The control head must be installed remotely using a Model MB-P2 Control Head Mounting Bracket. The bracket must be anchored to the wall using bolts or lag screws.

In order to actuate the agent cylinder(s) from a control head, a 1/4" NPT x 45° 1/4" flare type fitting (conforming to SAE J513c) must be screwed into the base of the control head actuator. Pneumatic tubing is then used to connect the control head to the valve cap assembly of each agent cylinder valve. See **Figure 4-3**.

NOTE

Pneumatic tubing used for remote cylinder actuation shall have an outside diameter of 1/4" with a minimum wall thickness of 1/32". This is commonly known as refrigeration-type copper tubing. All tubing fittings shall be of the 1/4", 45° flare type conforming to SAE J513c.

Compression type fittings are not acceptable.

A single Model MCH3/ECH3/NMCH3 Control Head can actuate three (3) agent cylinders with a maximum of eight (8) feet of pneumatic tubing.

B. Multiple Cylinder Actuation Using Model PAC-10 Pneumatic Actuation Cylinder.

The Model PAC-10 Pneumatic Actuation Cylinder must be used if more than three (3) agent cylinders require simultaneous actuation. The Model PAC-10 must be used in conjunction with a Model MCH3/ECH3/NMCH3 Control Head. The control head is mounted on the Model PAC-10 valve assembly.

The Model PAC-10 is shipped complete with a mounting bracket. The cylinder must be mounted vertically with the nameplate facing out. The bracket must be securely anchored to the wall using bolts or lag screws. The wall to which the bracket is attached must be sufficiently strong to support the pneumatic cylinder. The bracket should never be fastened to dry wall or similar material. If this type of wall is encountered, studs must be located and the bracket fastened to them. See **Figure 4-4**.

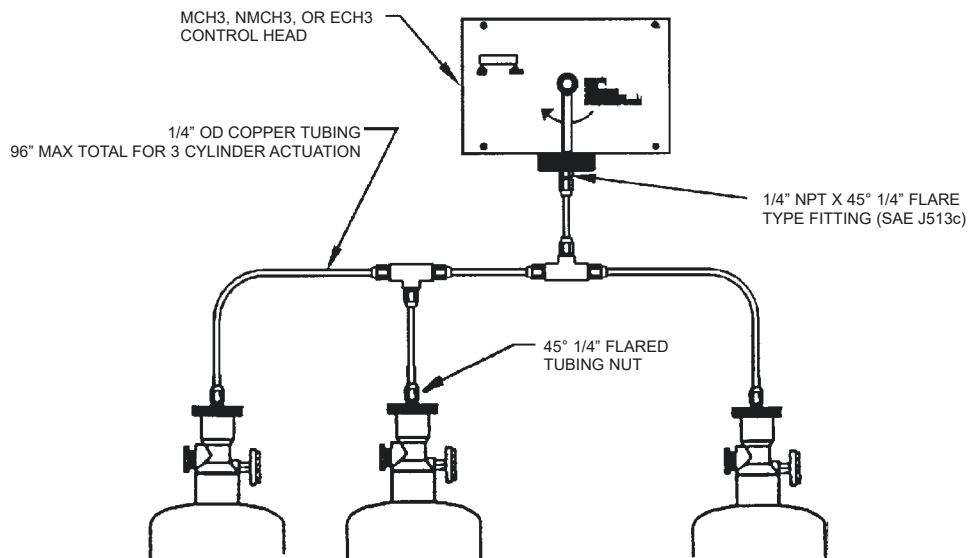


Figure 4-3. Multiple Cylinder Actuation Using Model MCH3/ECH3/NMCH3 Control Head.

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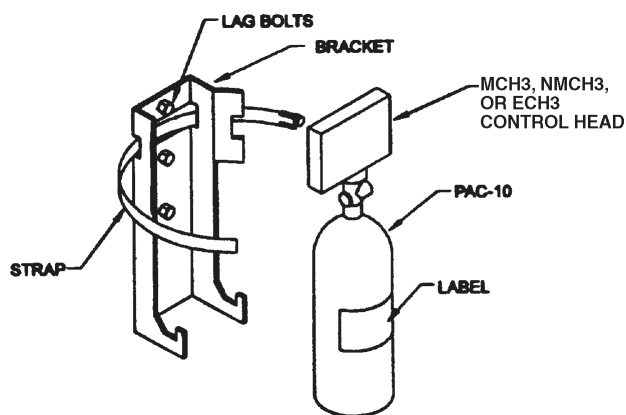


Figure 4-4. Model PAC-10 Pneumatic Cylinder Installation.

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In order to actuate the agent cylinders from a Model PAC-10 Pneumatic Actuation Cylinder, a 3/4" NPT x 1/4" NPT bushing must be screwed into the pneumatic cylinder's discharge port. A 1/4" NPT x 45° 1/4" flare type fitting (conforming to SAE J513c) must then be screwed into this bushing. Pneumatic tubing is then used to connect the PAC-10 pneumatic cylinder to the valve cap assembly of each agent cylinder valve. See **Figure 4-5**.

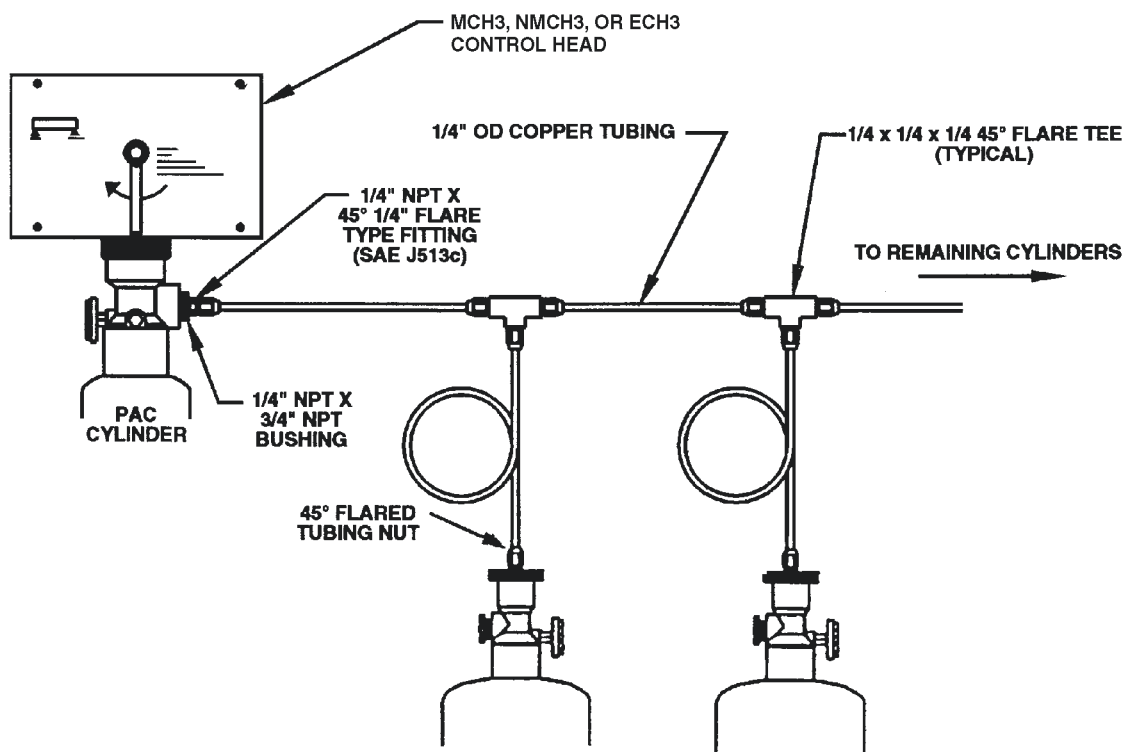


Figure 4-5. Multiple Cylinder Actuation Using Model MCH3/ECH3/NMCH3 Control Head.

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NOTE

Pneumatic tubing used for remote cylinder actuation shall have an outside diameter of 1/4" with a minimum wall thickness of 1/32". This is commonly known as refrigeration-type copper tubing. All tubing fittings shall be of the 1/4", 45° flare type conforming to SAE J513c.

Compression type fittings are not acceptable.

The Model PAC-10 pneumatic cylinder can actuate a maximum of ten (10) agent cylinders with a maximum of 100 feet of pneumatic tubing.

FUSIBLE LINK DETECTOR INSTALLATION

Fusible links are always used in conjunction with the Model MCH3 Mechanical Control Head. After mounting the cylinder and control head, the fusible link line can be installed. The first step to installing the fusible link line is to install the detector bracket(s). These brackets must be installed in the plenum area of the ventilation hood over all protected appliances and in each duct. See Chapter III for detector placement guidelines.

Note: Only ML-style Fusible Links can be used.

Connect the fusible link brackets together using 1/2" conduit and the conduit connectors supplied in the detector kit (Model FLK-1/1A). A Pyro-Chem Kitchen Knight II corner pulley must be used whenever a change in conduit direction is necessary. The conduit is connected to the control head through a knockout in the upper left-side corner.

In general, fusible links centered in the detector brackets are connected in series using 1/16" diameter stainless steel cable. The spring plate in the control head maintains tension on this series of fusible links. If the tension is released for any reason (i.e., a fusible link separates), the control head will operate and actuate the system. Maximum limitations for the fusible link detection line are as follows:

Fusible links can be installed with or without fusible link hangers (see **Chapter II** for description).

Fusible Link Line Limitations When Used with Model EN-MCU3, MCH3, and NMCH3 Control Heads and CBP-1, SBP-1, and WBP-1 Pulley Elbows

Maximum # of detectors:	20
Maximum length of cable:	150 feet
Maximum # of pulleys:	40

1. Fusible Link Installation Without Hangers.

Begin installing links at the terminal bracket. The link is connected to the far side of the terminal bracket using an "S" hook. The "S" hook must be crimped closed after the link is installed. A tight loop is then made in the cable and secured by the crimp provided. This loop is connected to the other side of the terminal link (see **Figure 4-6**) and the cable fed through the conduit to the next bracket. The cable proceeding from the terminal link will be used to connect the series links (see **Figure 4-7**). Series links must be centered in their detector brackets.

After the last link in the series is connected, the cable should be fed through the conduit back to the control head. Thread the cable through the hole in the fusible link ratchet wheel. The line must then be crimped, and the crimp positioned inside the center of the ratchet wheel.

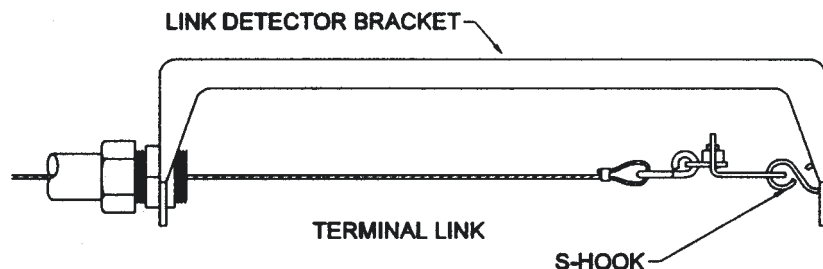


Figure 4-6. Terminal Link Installation.

002849aPC

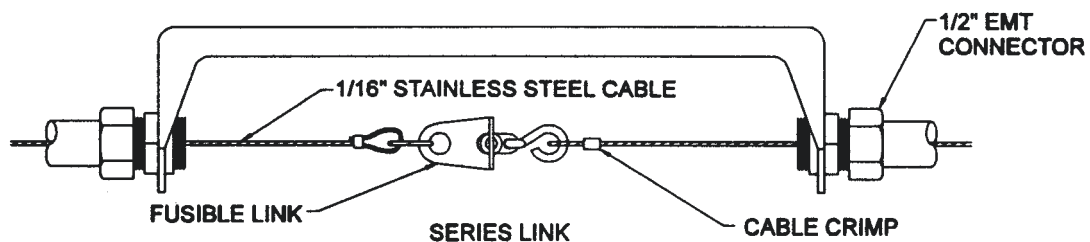


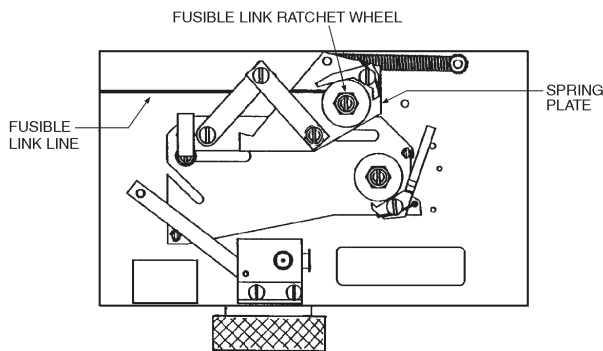
Figure 4-7. Series Link Installation.

002849bPC

NOTE

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. **The crimp must never be used on a single cable.**

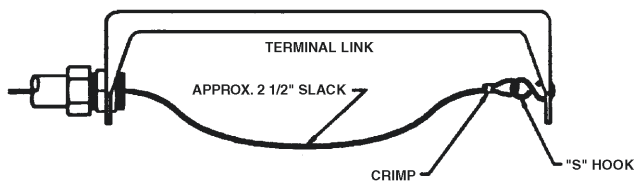
The fusible link line can now be put into a set position by applying tension to the fusible link line. This is accomplished by using a 1/2" hex wrench on the fusible link line ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the spring plate makes contact with the top of the control head box. The fusible link line is now in a set position. See **Figure 4-8**.

**Figure 4-8. Fusible Link Line Termination.**

006215PC

2. Fusible Link Installation Using Model FLH-1 Fusible Link Hangers.

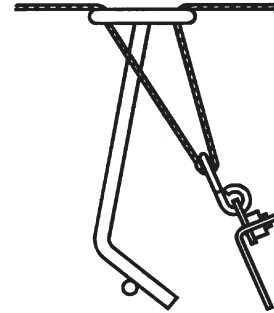
Beginning at the control head, feed the stainless steel cable through the conduit and brackets to the terminal bracket in one continuous length. Allow approximately two and one-half (2.5) inches of slack at each bracket for the installation of the Fusible Link Hangers. At the terminal link, a tight loop is made in the cable and secured by the crimp provided. The cable is attached to the far side of the terminal bracket using an "S" hook. The "S" hook must be crimped closed after the cable is installed. See **Figure 4-9**.

**Figure 4.9. Terminal Bracket Connection.**

002877PC

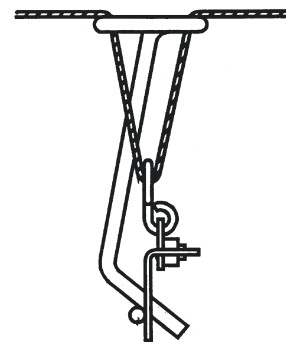
Begin installing the Fusible Link Hangers at the terminal bracket and work toward the control head. Loop the cable through the oval opening in the hanger and hook the fusible link on the loop. See **Figure 4-10**.

Note: Only ML-style Fusible Links can be used.

**Figure 4-10. Fusible Link Connection.**

002878PC

Hook the bottom of the link onto the bottom leg of the hanger. See **Figure 4-11**.

**Figure 4-11. Fusible Link/Hanger Connection.**

002879PC

Center the hanger/link in the fusible link bracket by sliding it along the link line. This is easily accomplished before any tension is applied to the link line. Repeat this procedure for all fusible links.

After the last hanger/link in the series is connected, the cable should be fed through the hole in the fusible link ratchet wheel. The line must then be crimped, and the crimp positioned inside the center of the ratchet wheel.

NOTE

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. **The crimp must never be used on a single cable.**

The fusible link line can now be put into a set position by applying tension to the fusible link line. This is accomplished by using a 1/2" hex wrench on the fusible link line ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the spring plate makes contact with the top of the control head box. The fusible link line is now in a set position. See **Figure 4-8**.

Check to ensure that the fusible link hanger(s) remain centered in the bracket after the fusible link line is set. See **Figure 4-12**.

NOTE

If wire rope requires splicing, a splice is to be a minimum of 12 in. from any pulley elbow or conduit adaptor to avoid interference.

THERMAL DETECTOR INSTALLATION

Thermal detectors are always used in conjunction with the Model ECH3 Electrical Control Head. After mounting the cylinder and control head, the thermal detector(s) can be installed. Install the thermal detector(s) in the plenum area of the ventilation hood over all protected appliances and in each duct. See **Chapter III** for detector placement guidelines. Follow the instructions included with the detector for proper detector mounting procedures.

SETTING THE CONTROL HEAD

1. Model MCH3/NMCH3 Mechanical Control Head.

Once the fusible link line is set, the control head can be placed in the set position. To set the control head, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position. Insert the pull pin into the hole in the slide plate

above the latching arm. This will lock the control head in the set position, eliminating accidental actuation during the rest of the installation procedure. See **Figure 4-13**.

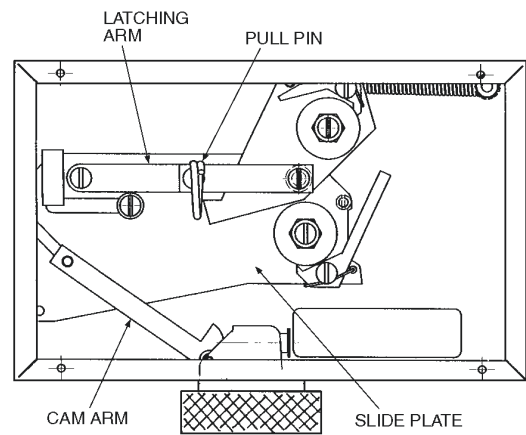


Figure 4-13. Control Head In Set Position.

006219PC

2. Model ECH3 Electrical Control Head.

Once the thermal detectors have been installed, the control head can be placed in the set position. To set the control head, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position. Insert the pull pin into the hole in the slide plate above the latching arm. This will lock the control head in the set position, eliminating accidental actuation during the rest of the installation procedure.

Once the Model ECH3 Electrical Control Head is in the set position, it can be connected to the detection/actuation circuit.

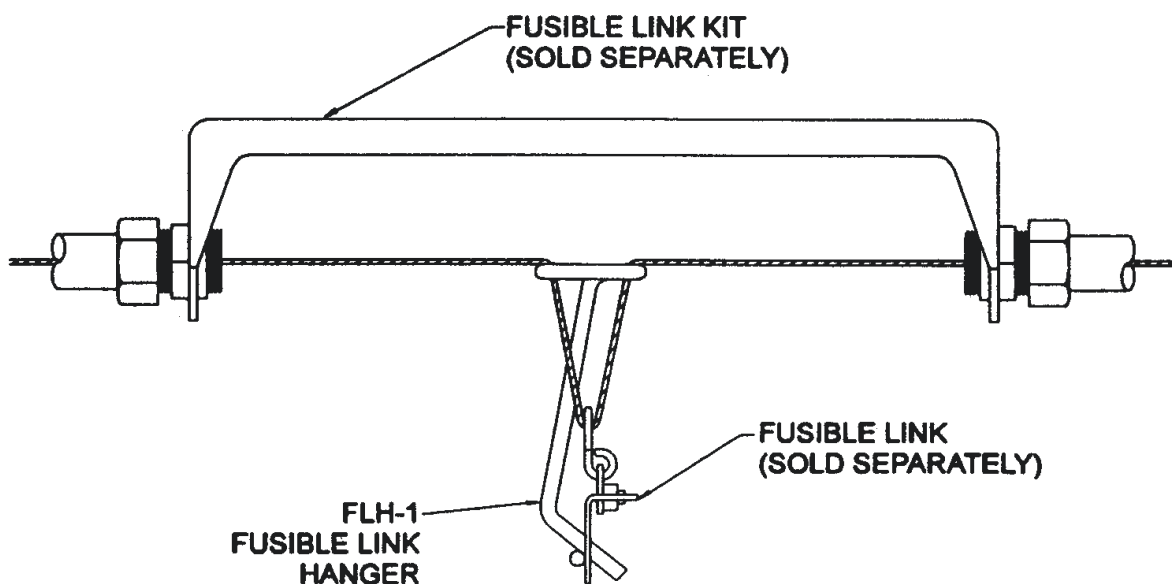


Figure 4-12. Fusible Link/Hanger In Set Position.

002849bPC

NOTE

No electrical connections shall be made inside the control head. All electrical wiring shall exit the control head through the knock-out on the side of the box. All electrical connections must be made in an approved electrical box.

Connect one of the black wires on the solenoid in the control head to the red wire of the Model MS-SPDT Miniature Switch. The brown wire from the miniature switch is then connected to one side of the first thermal detector in series. Connect the other side of the first thermal detector in series and the remaining black wire on the solenoid in the control head to the appropriate power source after installing the Model SM-24/120 Solenoid Monitor.

CAUTION

The solenoid must never be wired “hot” (not through the micro-switch). If wired this way, the non-field replaceable solenoid will be damaged and the complete control head will require replacement.

NOTE

A Model SM-24/120 Solenoid Monitor must always be used with an Electrical Control Head to supervise the actuation/detection circuit.

Where electrical detection and/or actuation is provided, supervision shall be provided in accordance with NFPA-17A.

Alarms and indicators along with a supervised backup power source shall be provided in accordance with NFPA 72, The National Fire Alarm Code.

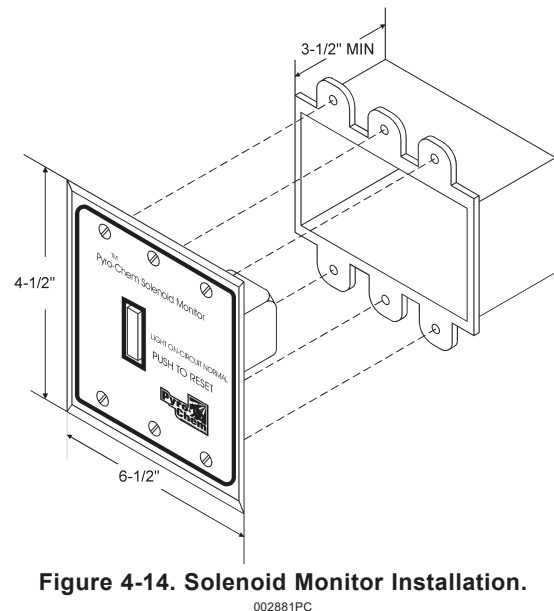
Electrical wiring and equipment shall be installed in accordance with NFPA 70, National Electric Code or the requirements of the authority having jurisdiction.

The Model ECH3-24 Electrical Control Head requires a 24VDC power supply with a minimum 2A rating. The Model ECH3-120 Electrical Control Head requires a 1A, 120VAC power supply.

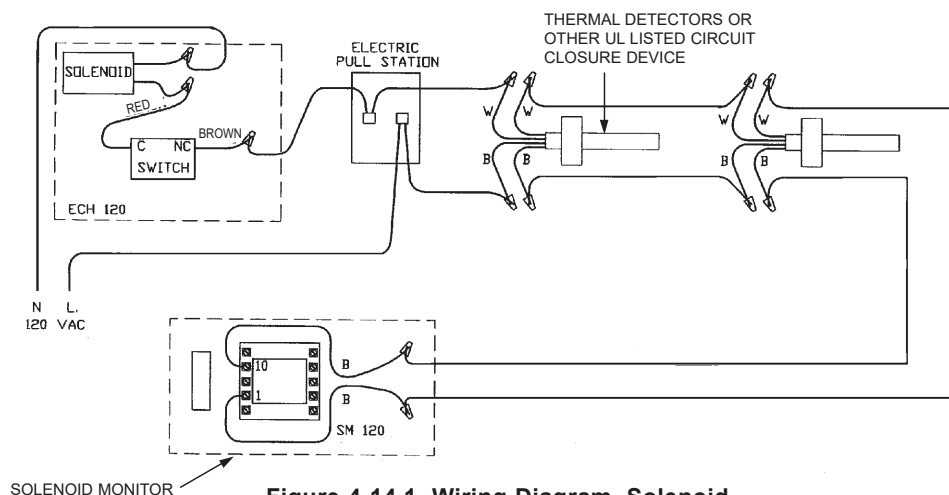
SOLENOID MONITOR INSTALLATION**1. Solenoid Monitor Installation in Detection Circuit.**

After installing the thermal detectors and the control head, the Model SM-120/24 Solenoid Monitor can be installed. The Solenoid Monitor is connected to the wires leading from the last thermal detector. It should be mounted in a location where it can be readily observed.

The Solenoid Monitor is an end-of-line device that supervises the actuation/detection circuit. It is comprised of a push-type switch with a built-in indicator light, a plug-type relay, a relay socket, and a cover plate. The light, when illuminated, indicates that the detection/actuation circuit is in the normal condition. The Solenoid Monitor also provides two sets of dry contacts. The Solenoid Monitor's cover plate is used to mount the Solenoid Monitor in a standard 6" x 4" x 3" deep electrical box. See **Figure 4-14**.

**Figure 4-14. Solenoid Monitor Installation.**

002881PC

**Figure 4-14.1. Wiring Diagram, Solenoid.**

002882PC

All wire for circuits using the Model SM-24 shall be 18 gage minimum, or as required by local code. All wire for circuits using the Model SM-120 shall be 14 gage minimum, or as required by local code. The basic wiring diagram for both the Model SM-24 and Model SM-120 is shown in **Figure 4-14.1**.

After the Solenoid Monitor has been installed, the detection/actuation circuit can be connected to the appropriate power source and energized. To energize the detector/actuation circuit, depress the switch on the Solenoid Monitor. The light will illuminate to indicate that the circuit is properly installed. If the light fails to illuminate, the wiring must be checked.

2. Solenoid Monitor When Used As A Reset Relay

The Model SM-24/120 can be used as a reset relay when required. A reset relay is required whenever an electrical gas shut-off valve is used in conjunction with the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. For typical wiring connections, see **Figure 4-15**.

REMOTE PULL STATION INSTALLATION

The Model RPS-M Remote Mechanical Pull Station is used for remote mechanical actuation of all system releasing devices. It is to be located near an exit in the path of egress from the hazard area no more than five feet above the floor.

NOTE

A Model RPS-M Remote Mechanical Pull Station must be used for manual activation of a Model EN-MCU3 or a Model NMCH3 releasing device.

The Pull Station can be surface mounted or flush mounted. For flush mounting a RACO #232 4" deep electrical box or equivalent must be used (dealer supplied). It is connected to the releasing device using 1/16" diameter stainless steel cable. The cable enters the pull station box through the center hole in the bottom, top, either side, or the center back hole. The cable enters the control head through the

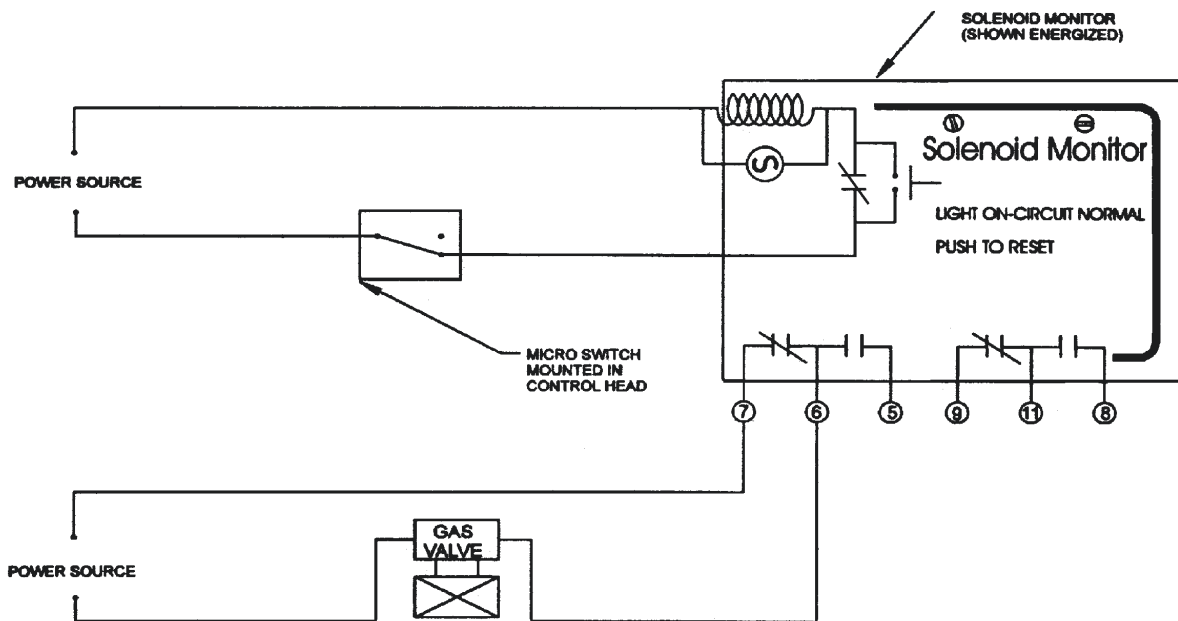


Figure 4-15. Solenoid Monitor Wiring With Electrical Gas Shutoff Valve.

002882PC

top-center knockout. The cable must be enclosed in 1/2" conduit with a Pyro-Chem Kitchen Knight II corner pulley at each change in conduit direction. Maximum limitations for the Model RPS-M Remote Mechanical Pull Station are as follows:

Model RPS-M Cable Run Limitations When Used with Model ECH3, MCH3, EN-MCU3, and NMCH3 Control Heads and CBP-1, SBP-1, and WBP-1 Pulley Elbows

Maximum length of cable:	150 feet
Maximum # of pulleys (1/16"):	40

After mounting the pull station box and conduit, feed the stainless steel cable from the releasing device, through the conduit, and into the pull station box. Feed the cable through the bushing and through the hole provided in the pull handle. Loop the cable through the pull handle and secure it with the crimp provided (see **Figure 4-16**).

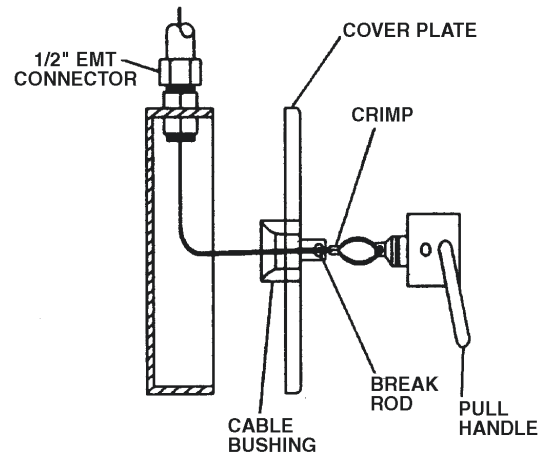


Figure 4-16. Model RPS-M Remote Pull Station Installation.

002884PC

Cut and thread the cable through the hole in the latching arm of the control head and pull the cable tight. Crimp the cable approximately ten (10) to twelve (12) inches below the latching arm. Note: NFPA-17A requires the pull length to be no more than 14 in.

NOTE

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. **The crimp must never be used on a single cable.**

Pull the pull handle until the crimp touches the latching arm. See **Figure 4-17**. Coil the excess cable in the pull box and attach the cover plate with the four screws provided. Insert the pull handle into the cover plate and insert the plastic break rod.

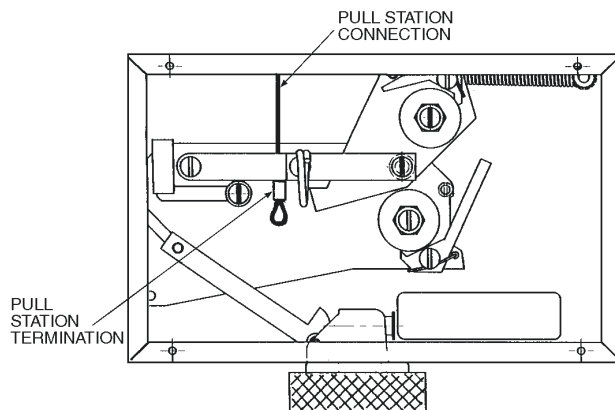
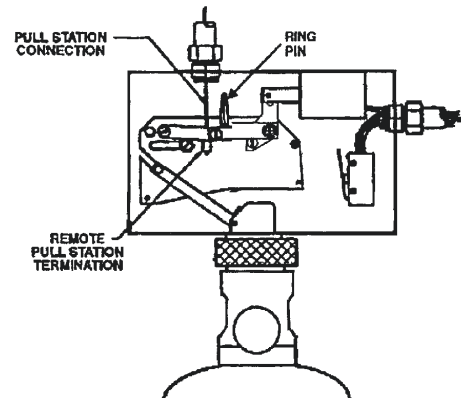


Figure 4-17. Model RPS-M Remote Pull Station.

006216PC/003647PC



GAS SHUT-OFF VALVE INSTALLATION

1. Mechanical Gas Shut-Off Valve Installation.

The Model MCH3/NMCH3 Control Head is used to operate the mechanical gas shut-off valve. This valve is located in the fuel gas supply line to the cooking appliance(s). The valve body has an arrow which indicates direction of gas flow through the valve. The gas shut-off valve is spring loaded and requires five pounds of force to hold it open. This force is supplied by a 1/16" diameter stainless steel cable that is connected to the control head.

After the valve is installed in the gas line, 1/2" conduit must be run from the top center knockout of the gas valve box to the lower right-hand knockout in the control head. A Pyro-Chem Kitchen Knight II corner pulley is used wherever a change in conduit direction is required.

Gas Valve Cable Run Limitations When Used with Model MCH3, EN-MCU3, and NMCH3 Control Heads and CBP-1, SBP-1, and WBP-1 Pulley Elbows

Maximum length of cable:	100 feet
Maximum # of pulleys:	30

Remove the gas valve cover and thread the stainless steel cable through the conduit back to the control head. Thread the cable through the hole in the gas valve ratchet wheel. The line must then be crimped, and the crimp positioned inside the center of the ratchet wheel.

NOTE

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. **The crimp must never be used on a single cable.**

At the gas valve, loop the cable through the valve stem and secure it with the crimp provided (see **Figure 4-18**).

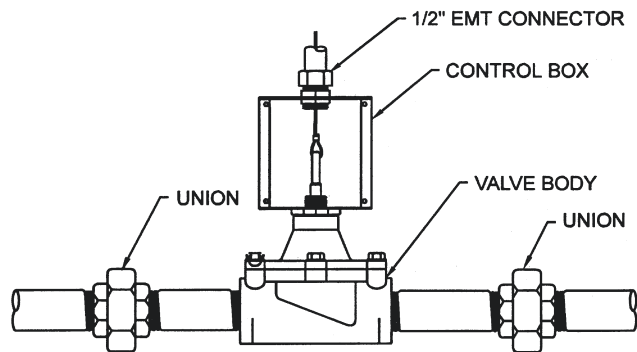


Figure 4-18. Gas Valve Installation.

002886PC

CAUTION

Do not overtighten gas valve. Overtightening the gas valve may cause the valve to not close completely, thus not fully shutting the fuel supply off to the appliance.

The gas valve line can now be put into a set position by applying tension to the gas valve line. This is accomplished by using a 1/2" hex wrench on the gas valve ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the gas valve is fully open. See Instruction Sheet, Part No. 550571, included in gas valve shipping assembly, for detailed information. Secure the gas valve cover plate to the gas valve box with the four (4) screws provided. The gas valve line is now in a set position. See **Figure 4-19**.

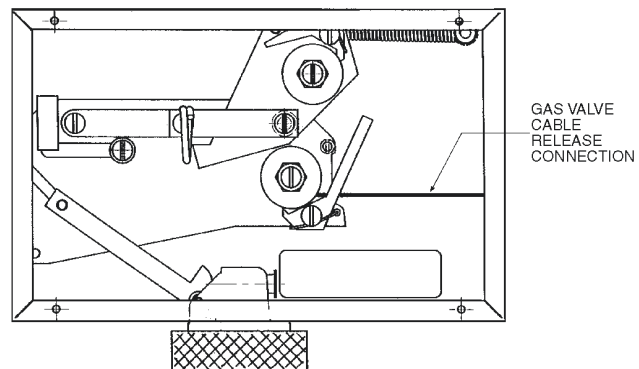


Figure 4-19. Gas Valve Line Termination.

006217PC

2. Electrical Gas Shut-Off Valve Installation.

The Model MCH3/ECH3/NMCH3 Control Head is used to operate the electrical gas shut-off valve. This valve is located in the fuel gas supply line to the cooking appliance(s). The valve body has an arrow which indicates direction of gas flow through the valve. A reset relay must always be used with an electrical gas shut-off valve. For proper wiring of the electrical gas shut-off valve, see **Figure 4-15**.

TEE PULLEY INSTALLATION

The Model TP-1 Tee Pulley is used to connect two (2) mechanical gas valves or two (2) remote mechanical pull stations to a single control head. The cable proceeding from the control head must always enter the branch of the tee pulley. See **Figure 4-20**.

A tee pulley that is used to close two (2) gas valves can only be used to close gas valves with similar stem travel. Gas valves from 3/4" up to 1 1/2" can be used on the same tee pulley. A 2" gas valve can be used only with another 2" gas valve. Gas valves from 2 1/2" up to 3" can be used on the same tee pulley. As an example, using a 3/4" gas valve with a 3" gas valve will not allow the 3" valve to fully open.

CAUTION

The tee pulley must never be used to connect multiple fusible link lines to a single control head.

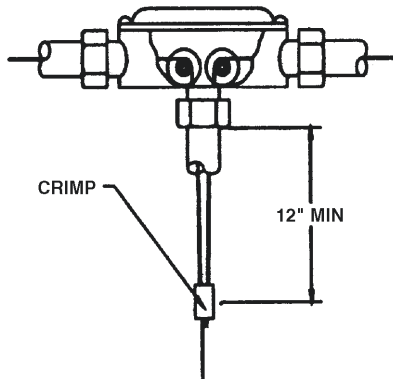


Figure 4-20. Tee Pulley Installation.
002888PC

MINIATURE SWITCH INSTALLATION

The Model MS-SPDT, MS-DPDT, MS-3PDT, or MS-4PDT Miniature Switch is available for use where an electrical output is required. These switches can be field installed in the control head. See **Figure 4-21** and **Figure 4-22** and refer to Instruction Sheet, Part No. 551159, included with switch shipping assembly, for detailed mounting instructions.

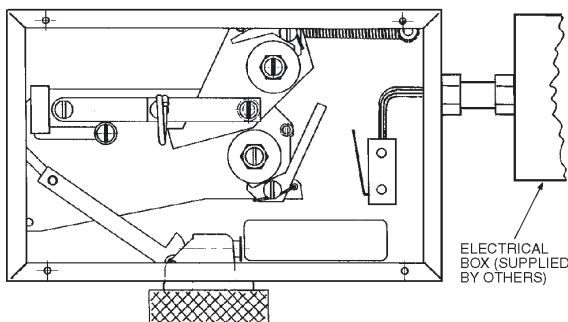


Figure 4-21. Miniature Switch Installation in Model MCH3 /NMCH3 Control Head.
006218PC

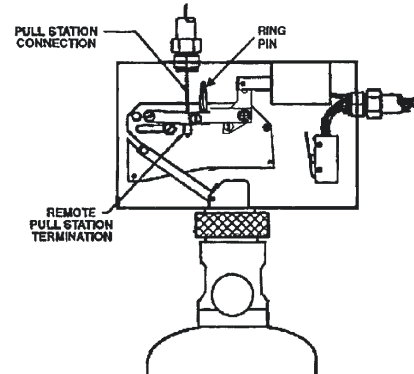


Figure 4-22. Miniature Switch Installation in Model ECH3 Control Head.
003647PC

NOTE

The Model ECH3 Control Head is supplied with a Model MS-DPDT Miniature Switch. However, one set of contacts on the switch must be used in the actuation/detection circuit and cannot be used for electrical output.

NOTE

No electrical connections shall be made inside the control head. All electrical wiring shall exit the control head through the knock-out on the side of the box. All electrical connections must be made in an approved electrical box.

These switches may be used to provide an electrical signal to the main breaker and/or operate electrical accessories provided the rating of the switch is not exceeded. Wiring connections are shown in **Figure 4-23**. The contact ratings for the switch is as follows:

Contact Ratings For Miniature Switches

21 amps 1 HP, 125, 250, 277 VAC
or 2 HP, 250, 277 VAC

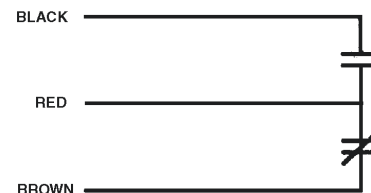


Figure 4-23. Wiring Diagram For Model MS-SPDT Miniature Switch.
002903PC

PIPE AND NOZZLE INSTALLATION

All pipe ends shall be thoroughly reamed after cutting and all oil and foreign matter removed from the pipe. It is recommended that the following procedures be followed:

1. Use Schedule 40 black iron, chrome-plated, or stainless steel pipe and fittings. Do not use hot-dipped galvanized iron pipe or fittings in the agent distribution piping.
2. Before assembling the pipe and fittings, make certain all ends are carefully reamed and blown clear of chips and scale. Inside of pipe and fittings must be free of oil and dirt.
3. The distribution piping and fitting connections, located in the hood or the protected area, must be sealed with pipe tape. When applying pipe tape, start at the second male thread and wrap the tape (two turns maximum) clockwise around the threads, away from the pipe opening.
4. Do not over-tighten, but be sure the pipe is snug. Do not back-off sections of pipe to make them fit better. If the pipe was cut too short, re-cut another pipe to the proper length.

CAUTION

Do not apply Teflon tape to cover or overlap the pipe opening, as the pipe and nozzles could become blocked and prevent the proper flow of agent.

Do not use thread sealant or pipe joint compound.

All piping shall be securely fastened by means of pipe hangers and/or pipe straps. A union should be installed in the discharge piping, as close to the cylinder valve as possible, to permit disconnection and removal for inspection and service. Dry air or nitrogen should be blown through the discharge piping to remove chips and other debris prior to installation of nozzles.

Nozzles shall be installed in accordance with the limitations described in **Chapter III** of this manual. Blow-off caps are provided for each nozzle. These will prevent dirt and grease from clogging the nozzle.

SYSTEM CHECKOUT AFTER INSTALLATION

1. Model MCH3/NMCH3 Mechanical Control Head.

Before putting the system into service, all components must be checked for proper operation. During this checkout, assure that the carbon dioxide pilot cartridge is not installed in the control head actuator. Remove the pull pin from the hole in the slide plate.

To check satisfactory operation of the control head, cut the terminal link or the “S” hook holding the link. This will relieve all tension on the fusible link line and operate the control head. The slide plate will have moved fully to the right. The gas valve cable will have been released, causing the gas valve to close. Any auxiliary equipment connected to the dry contacts of the solenoid monitor and/or the Miniature Switch in the control head will have operated.

If any of these events fail to occur, the problem must be investigated and repaired.

Repair the terminal link and put the fusible link line back into the set position. This is accomplished by using a 1/2” hex wrench on the fusible link line ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the spring plate makes contact with the top of the control head box.

Once the fusible link line is set (note: Refer to page 4-4 through 4-6 for fusible link installation details), the control head can be placed in the set position. To set the control head, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position.

Once the control head is set, pull the pull handle on the remote pull station to assure that the control head operates. If the control head operates normally, the control head can be reset as described above. Insert the pull pin into the hole in the slide plate above the latching arm. Replace the pull station handle, pull pin, and nylon tie.

Assure that the gas valve is fully open by ratcheting the gas valve ratchet wheel.

CAUTION

Before screwing the carbon dioxide pilot cartridge into the actuator, ensure that the actuator has a Teflon O-ring installed.

Using a felt-tipped marker, write the date of installation in the gray area of the carbon dioxide pilot cartridge. Screw the cartridge into the control head actuator until hand-tight. Never use a wrench to tighten the cartridge into the actuator.

Remove the pull pin from the hole in the slide plate and install the control head cover. Insert the pull pin through the local manual control handle and into the bushing. Secure the pull pin with the nylon tie provided.

2. Model ECH3-24/120 Electrical Control Head.

Before putting the system into service, all components must be checked for proper operation. During this checkout, assure that the carbon dioxide pilot cartridge is not installed in the control head actuator. Remove the pull pin from the hole in the slide plate.

To check satisfactory operation of the control head, apply heat to the last thermal detector in series. This will operate the control head. The slide plate will have moved fully to the right. The indicator light on the solenoid monitor will go out. Any auxiliary equipment connected to the dry contacts of the solenoid monitor and/or the Miniature Switch in the control head will have operated.

If any of these events fail to occur, the problem must be investigated and repaired.

Once the thermal detector has cooled, the control head can be placed in the set position. To set the control head, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position.

Once the control head is set, pull the pull handle on the remote pull station to assure that the control head operates. If the control head operates normally, the control head can be reset as described above. Insert the pull pin into the hole in the slide plate above the latching arm. Replace the pull station handle, pull pin, and nylon tie.

Energize the actuation/detection circuit by depressing the push button on the solenoid monitor.

CAUTION

Before screwing the carbon dioxide pilot cartridge into the actuator, ensure that the actuator has a Teflon O-ring installed.

Using a felt-tipped marker, write the date of installation on the carbon dioxide pilot cartridge. Screw the cartridge into the control head actuator until hand-tight. Never use a wrench to tighten the cartridge into the actuator.

Remove the pull pin from the hole in the slide plate and install the control head cover. Insert the pull pin through the local manual control handle and into the bushing. Secure the pull pin with the nylon tie provided.

ENCLOSURE INSTALLATION INSTRUCTIONS

MODEL EN-MCU3 (P/N 551208)

AND

MODEL EN-S (P/N 550966)

MOUNTING

The Model EN-MCU3 and/or EN-S Enclosure must be securely anchored to the wall using bolts or lag screws. The wall to which the enclosure is attached must be sufficiently strong. The enclosure should never be fastened to dry wall or similar material. If this type of wall is encountered, studs must be located and the enclosure fastened to them.

Three (3) center mounting holes allow either enclosure to be mounted on a single stud. Four (4) corner mounting holes are also available. See **Figure 4-24**.

FUSIBLE LINK DETECTOR INSTALLATION

The Model EN-MCU3 Enclosure can support a fusible link detection system. The Model EN-S Enclosure cannot support a fusible link detection system and must be used in conjunction with the Model EN-MCU3 Enclosure or a Model MCH3/ECH3/NMCH3 Control Head.

After mounting the enclosure, the fusible link line can be installed. The first step to installing the fusible link line is to install the detector brackets. These brackets must be installed in the plenum area of the ventilation hood over all protected appliances and in each duct. See **Chapter III** for detector placement guidelines. Connect the fusible link brackets together using 1/2" EMT conduit and the conduit connectors supplied in the detector kit (Model FLK-1/1A). Pyro-Chem Kitchen Knight II corner pulleys must be used whenever a change in conduit direction is necessary. The conduit is connected to the enclosure through a top knockout.

See Fusible Link Detector Installation Section of this chapter (pages 4-4 - 4-6) for fusible link installation guidelines. Before attaching the stainless steel cable to the fusible link line ratchet wheel, it must be run below the fusible link line pulley in the enclosure. See **Figure 4-25**.

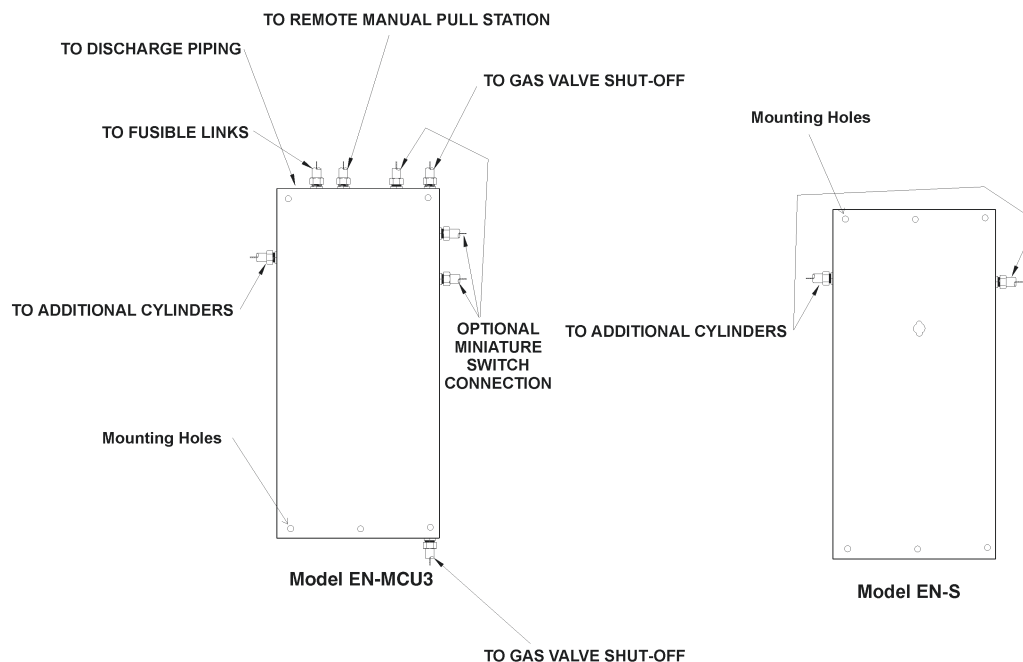


Figure 4-24. Models EN-MCU3 and EN-S Enclosures.

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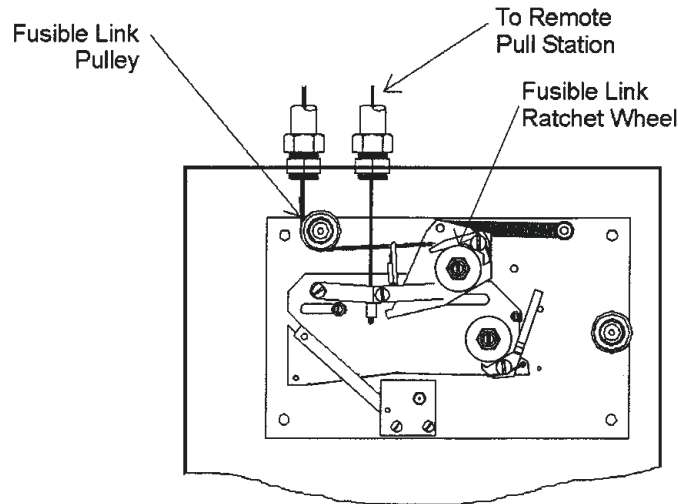


Figure 4-25. Model EN-MCU3 Fusible Link Line and Remote Pull Station Termination.

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SETTING THE MODEL EN-MCU3

After the last link in the series is connected, the cable should be fed through the conduit back to the Model EN-MCU3. It must be fed under the fusible link line pulley and through the hole in the fusible link ratchet wheel. The line must then be crimped, and the crimp positioned inside the ratchet wheel.

NOTE

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. **The crimp must never be used on a single cable.**

Crimps must always be used in conjunction with two (2) cable lengths. Loops are the accepted method of connecting the cable to mechanical components. The crimp must never be used on a single cable.

The fusible link line can now be put into a set position by tensioning the fusible link line. This is accomplished by using a 1/2" hex wrench on the fusible link line ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the spring plate is parallel to the top of the enclosure. The fusible link line is now in a set position.

Once the fusible link line is set, the Model EN-MCU3 Enclosure can be placed in the set position. To set the Model EN-MCU3, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position. Insert the pull pin into the hole in the slide plate above the latching arm. This will lock the control mechanism in the set position, eliminating accidental actuation during the rest of the installation procedure. See **Figure 4-25**.

REMOTE PULL STATION INSTALLATION

The Model RPS-M Remote Mechanical Pull Station is used for remote manual actuation of the Model EN-MCU3. It is to be located near an exit in the path of egress from the hazard area no more than five feet above the floor.

The Pull Station is connected to the Model EN-MCU3 using 1/16" diameter stainless steel cable. The cable enters the Model EN-MCU3 through a knockout in the top of the enclosure. See **Figure 4-25**.

See [Remote Pull Station Installation](#) Section of this chapter for remote pull station installation guidelines.

GAS SHUT-OFF VALVE INSTALLATION

The Model EN-MCU3 can be used to operate a mechanical gas shut-off valve. This valve is located in the fuel gas supply line to the cooking appliance(s). The valve body has an arrow which indicates direction of gas flow through the valve. The gas shut-off valve is spring loaded and requires five pounds of force to hold it open. This force is supplied by a 1/16" diameter stainless steel cable that is connected to the Model EN-MCU3.

See "Gas Shut-Off Valve Installation" section of this chapter for gas valve shut-off installation guidelines.

After the valve is installed in the gas line, 1/2" conduit must be run from the top center knockout of the gas valve box to the top or bottom knockout in the enclosure. See **Figure 4-24**. A Pyro-Chem Kitchen Knight II corner pulley is used wherever a change in conduit direction is required.

Remove the gas valve cover and thread the stainless steel cable through the conduit back to the Model EN-MCU3. If the cable enters the enclosure through the bottom knockout, the cable must be run over the gas valve line pulley (see **Figure 4-26**). If the cable enters the enclosure through the top knockout, the cable must be run under the gas valve line pulley (see **Figure 4-27**). Thread the cable through the hole in the gas valve ratchet wheel. The line must then be crimped, and the crimp positioned inside the center of the ratchet wheel.

CAUTION

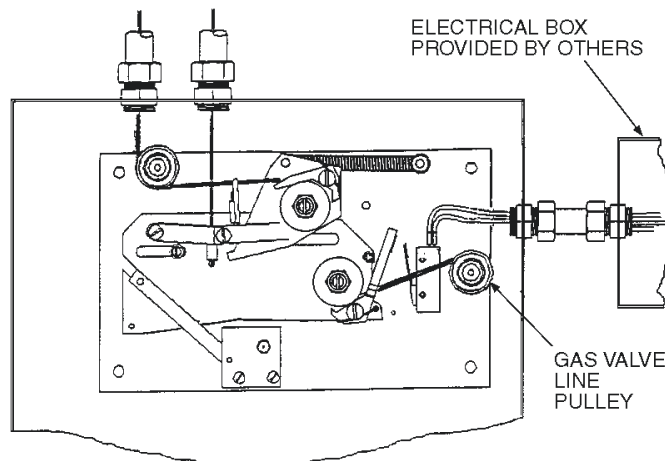
The gas valve cable must always utilize the gas valve pulley and exit the **top** or **bottom** of the enclosure. **The gas valve cable cannot exit the side of the enclosure.**

At the gas valve, loop the cable through the valve stem and secure it with the crimp provided (see **Figure 4-18**, page 4-10).

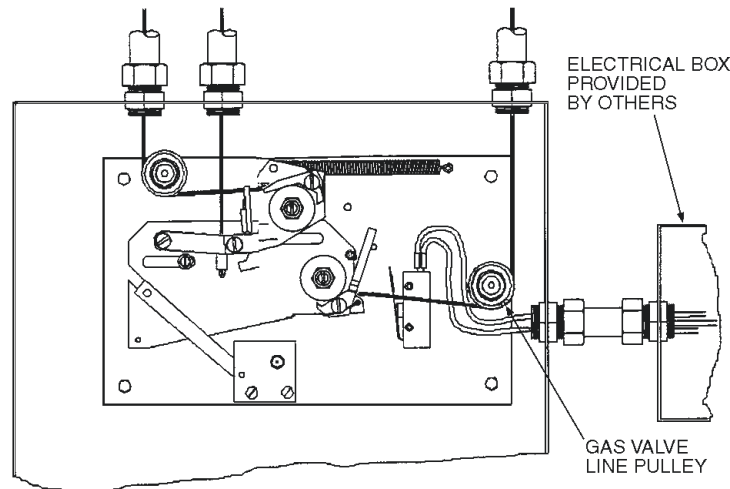
The gas valve line can now be put into a set position by applying tension to the gas valve line. This is accomplished by using a 1/2" hex wrench on the gas valve ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the gas valve is fully open. Secure the gas valve cover plate to the gas valve box with the four (4) screws provided. The gas valve line is now in a set position. See **Figure 4-26** and/or **Figure 4-27**.

CAUTION

Do not overtighten gas valve. Overtightening the gas valve may cause the valve to not close completely, thus not fully shutting the fuel supply off to the appliance.

**Figure 4-26. Gas Valve / Miniature Switch Installation.**

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**Figure 4-27. Gas Valve / Miniature Switch Installation.**

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MINIATURE SWITCH INSTALLATION

The Model MS-SPDT, MS-DPDT, MS-3PDT, or MS-4PDT-EN Miniature Switch is available for use where an electrical output is required. These switches can be field installed in the Model EN-MCU3. See **Figure 4-26** and/or **Figure 4-27**.

These switches may be used to provide an electrical signal to the main breaker and/or operate electrical accessories provided the rating of the switch is not exceeded. Wiring connections for the Model MS-SPDT are shown in **Figure 4-23** (page 4-11). The contact ratings for both switches are as follows:

Contact Ratings For Miniature Switches: 21 amps 1 HP, 125, 250, 277 VAC or 2 HP, 250, 277 VAC

Three (3) knockouts are provided for Miniature Switch wiring. The upper right-side knockout must be used when the gas valve line exits the bottom of the enclosure (see **Figure 4-26**). The lower right-side knockout must be used when the gas valve line exits the top of the enclosure (see **Figure 4-27**). An additional knockout located on the top of the enclosure is also provided (see **Figure 4-24**) and may be used in either situation.

NOTE

No electrical connections shall be made inside the control head. All electrical wiring shall exit the control head through the knock-out on the side of the box. All electrical connections must be made in an approved electrical box.

CYLINDER INSTALLATION

1. Single Cylinder Installation - PCL-300/460.

The Model EN-MCU3 can be used for single cylinder installations. It can support either the Model PCL-300 or PCL-460 cylinder assemblies. The cylinder must be placed in the enclosure with the discharge port to the left. **No additional mounting bracket is required when the Model EN-MCU3 is used.**

In order to actuate the agent cylinder from the Model EN-MCU3's control mechanism, pneumatic tubing must be used to connect the actuator to the valve cap assembly of the agent cylinder valve. A 1/4" NPT x 1/4", 45° flare type elbow is included and must be installed in the actuator of the Model EN-MCU3 Enclosure. See **Figure 4-28**.

NOTE

Pneumatic tubing used for cylinder actuation shall have an outside diameter of 1/4" with a minimum wall thickness of 1/32". This is commonly known as refrigeration-type copper tubing. All tubing fittings shall be of the 1/4", 45° flare type conforming to SAE J513c. **Compression type fittings are not acceptable.**

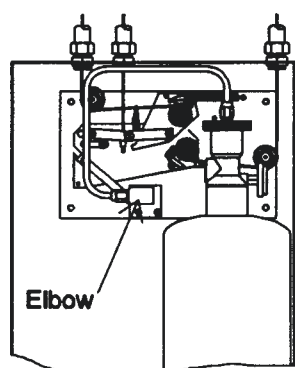


Figure 4-28. Single Cylinder Installation with Model EN-MCU3 Mechanical Control Unit.

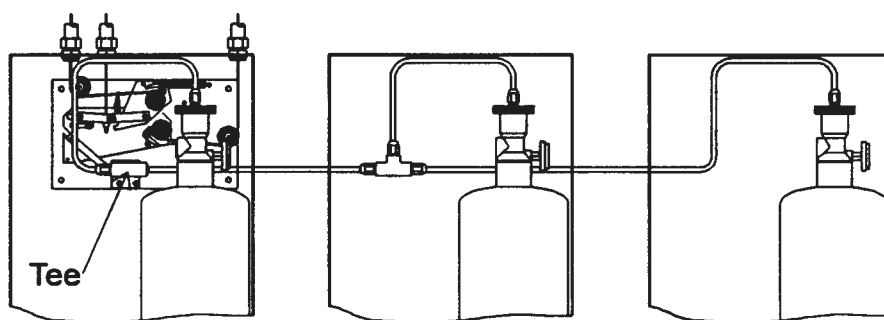


Figure 4-29. Multiple Cylinder Installation with Model EN-MCU3 Enclosure and Model EN-S Enclosure.

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2. Multiple Cylinder Installation - PCL-300/460.

The Model EN-S can be used in conjunction with the Model EN-MCU3 Enclosure or Model MCH3/ECH3 Control Head for multiple cylinder installations. A single Model EN-MCU3 can be used to pneumatically actuate a maximum of three (3) agent cylinders. One (1) agent cylinder can be installed in the Model EN-MCU3 Enclosure; the additional agent cylinder(s) can either be mounted in a Model EN-S Enclosure or with a Model MB-15 Mounting Bracket. When an enclosure is used, the cylinders must be placed in the enclosure(s) with the discharge port to the left. **No additional mounting bracket is required when a cylinder is installed in the Model EN-MCU3 or EN-S Enclosure.**

In order to actuate the agent cylinders from the Model EN-MCU3, pneumatic tubing must be used to connect the EN-MCU3 actuator to the valve cap assembly of each agent cylinder valve. Pneumatic tubing must be run from the actuator in the Model EN-MCU3 to the Model EN-S(s) through the side knockout. A 1/4", 45° flare x 1/4", 45° flare x 1/4" NPT tee is included with the Model EN-S and must be installed in the Model EN-MCU3 actuator. See **Figure 4-29**.

NOTE

Pneumatic tubing used for remote cylinder actuation shall have an outside diameter of 1/4" with a minimum wall thickness of 1/32". This is commonly known as refrigeration-type copper tubing. All tubing fittings shall be of the 1/4", 45° flare type conforming to SAE J513c. **Compression type fittings are not acceptable.**

A single Model EN-MCU3 can actuate a maximum of three (3) cylinders with up to 8' of copper tubing.

SYSTEM CHECKOUT AFTER INSTALLATION

Before putting the system into service, all components must be checked for proper operation. During this checkout, assure that the carbon dioxide pilot cartridge is not installed in the Model EN-MCU3 actuator. Remove the pull pin from the hole in the slide plate.

To check satisfactory operation of the control mechanism, cut the terminal link or the “S” hook holding the link. This will relieve all tension on the fusible link line and operate the control mechanism. The slide plate will have moved fully to the right. The gas valve cable will have been released, causing the gas valve to close. Any auxiliary equipment connected to the dry contacts of the solenoid monitor and/or the Miniature Switch in the Model EN-MCU3 will have operated.

If any of these events fail to occur, the problem must be investigated and repaired.

Repair the terminal link and put the fusible link line back into the set position. This is accomplished by using a 1/2” hex wrench on the fusible link line ratchet wheel. The ratchet wheel will be ratcheted in a clockwise direction until the spring plate is parallel to the top of the enclosure.

Once the fusible link line is set, the control mechanism can be placed in the set position. To set the control mechanism, the slide plate is moved from right to left, ensuring the bolt extending from the cam arm is in the slot provided in the slide plate. Continue moving the slide plate to the left until the latching arm is in the locked position. Once the control mechanism is set, pull the pull handle on the remote pull station to assure that the control head operates. If the control mechanism operates normally, the control mechanism can be reset as described above. Insert the pull pin into the hole in the slide plate above the latching arm. Replace the pull station handle, pull pin, and nylon tie.

Assure that the gas valve is fully open by ratcheting the gas valve ratchet wheel. **Do not overtighten.**

CAUTION

Before screwing the carbon dioxide pilot cartridge into the actuator, ensure that the actuator has a Teflon O-ring installed.

Using a felt-tipped marker, write the date of installation on the carbon dioxide pilot cartridge. Screw the cartridge into the Model EN-MCU3 actuator until hand-tight. **Never use a wrench to tighten the cartridge into the actuator.**

Remove the pull pin from the hole in the slide plate. Secure the Model EN-MCU3 or EN-S cover with the screws provided.

NOTES:

CHAPTER V SYSTEM MAINTENANCE

GENERAL

This chapter will detail the basic information necessary for proper maintenance of the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. However, before attempting any system maintenance, it is necessary to attend a Factory Certification Training Class and become certified to install and maintain the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. Because it is difficult to completely understand every aspect of an intricate pre-engineered system simply by reading the Technical Manual, Pyro-Chem Kitchen Knight II will not be responsible for system maintenance performed by any non-certified person(s).

SEMI-ANNUAL MAINTENANCE

1. Check that the hazard area has not changed.
2. Check that the system has not been tampered with, ie., nozzles removed, nozzles not aimed properly, piping not supported properly, blow off caps in place.
3. Check the entire system for mechanical damage.
4. Check all nozzle orifices to make certain they are not plugged. Replace blow off caps or O-ring if necessary.

CAUTION

Before continuing, remove the cover from the control head and insert the safety pin in the hole in the slide plate above the latching arm. This will secure the system, preventing accidental discharge.

5. Disconnect the control head or pneumatic tubing from the valve cap assembly of each agent cylinder. Remove the carbon dioxide pilot cartridge in the control head. Remove the safety pin from the slide plate. Actuate the control head to ensure it is functioning properly. Make certain the gas shut-off valve and remote pull station are functioning properly.
6. Inspect the fusible link detectors and pulley elbows for excessive grease buildup. Clean or replace links or elbows if necessary.
7. Reinstall the carbon dioxide pilot cartridge, reconnect the control head, and replace the control head cover and nylon tie.
8. Inspect the cylinder pressure. Tap the gauge lightly to ensure the needle is moving freely.

ANNUAL MAINTENANCE

1. Inspect as per semi-annual maintenance instructions. Do not reconnect control head at this time.
2. Disconnect the discharge piping from the valve outlet. Using air or nitrogen, blow out the piping. Replace all nozzle caps.
3. Remove the cylinder to verify the fill weight as shown on the nameplate.
4. Replace the carbon dioxide pilot cartridge.
5. Replace all fusible link detectors.
6. Reconnect the control head. Replace the control head cover and nylon tie.

12-YEAR MAINTENANCE

Along with the required annual maintenance requirements, the tanks must be removed from the system, properly discharged, and hydrostatically tested per the requirements of NFPA-17A. The tank should be refilled with fresh agent.

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NOTES:

CHAPTER VI SYSTEM RECHARGE

GENERAL

This chapter will detail the basic information necessary for proper recharge of the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. However, before attempting any system recharge, it is necessary to attend a Factory Certification Training Class and become certified to install, maintain, and recharge the Pyro-Chem Kitchen Knight II Restaurant Fire Suppression System. Because it is difficult to completely understand every aspect of an intricate pre-engineered system simply by reading the Technical Manual, Pyro-Chem Kitchen Knight II will not be responsible for system recharge performed by any non-certified person(s).

SYSTEM CLEANUP

CAUTION

Before attempting any cleanup, make certain that all fuel sources to the equipment to be cleaned have been shut off. Make certain that the exhaust hood and all appliance electrical controls have been de-energized to avoid any chance of electrical shock resulting from the cleaning process of electrically conductive alkaline liquid agent and/or its residue.

Make certain all surfaces to be cleaned have cooled down to room temperature.

Do not use water to clean any appliances that contain hot grease or cooking oils. Doing so may result in violent steaming and/or spattering.

SYSTEM RECHARGE

NOTE

Determine the cause of system discharge and correct immediately before performing system recharge.

1. After discharge, inspect the entire system for mechanical damage. If the tank has sustained any mechanical damage, it must be hydrostatically tested before refilling.
2. Disconnect the 1/4 in. actuation tubing or the control head from the top of the tank valve.
3. Relieve the pressure from the top chamber of the tank valve by depressing the core of the valve in the valve cap assembly. By performing this operation, the valve will close.

4. Slowly remove the valve and siphon tube. If there is any residual pressure left in the tank, it will bleed out through the pressure relief slot in the valve threads.
5. **The complete piping system must be flushed after a discharge.** Flushing solution, Part No. 79656, must be used when flushing the system. The solution is shipped in a 32 oz. container. A PCL-300 tank requires 1 container of solution. A PCL-460 requires 1 1/2 containers, and a PCL-600 requires 2 containers. To prepare the system for flushing:
 - a. Pour the required amount of flushing solution into the tank.
 - b. Fill the tank approximately half full with warm, clear water. Agitate the tank for a few seconds and then add more warm water to bring the level to the required fill line using the measuring stick, Part No. 551039.
 - c. Reinstall valve and pickup tube and pressurize tank to 225 psi and reinstall to piping network.
6. With nozzles in place, attach control head and manually actuate the tank. Allow the tank to completely discharge through the piping network.
7. After the discharge is completed, the entire piping network must be blown out with air or nitrogen until no more mist is visual coming out of the nozzles.
8. Remove, clean, and reinstall all nozzles.
9. Remove the tank from the system. Slowly remove the valve and siphon. If there is any residual pressure left in the tank, it will bleed out through the pressure relief slot in the valve threads. The valve and pressure regulator (located in outlet of valve) must be cleaned and rebuilt after each discharge. To rebuild the valve, use rebuilding kit, Part No. 550698. To rebuild the pressure regulator, use rebuilding kit, Part No. 551061. Each kit includes an instruction sheet listing detailed rebuilding instructions.
10. Fill tank with required amount of Kitchen Knight agent, Part No. 551188, using measuring stick, Part No. 551039. Tank should be filled to a tolerance of $-0/+1/8$ in. from the mark level on the measuring stick.

NOTE

During filling, the agent temperature should be 60 °F to 80 °F (16 °C to 27 °C).

11. Reinstall valve and pickup tube and pressurize tank to 225 psi (using recharge adaptor, Part No. 551240). Invert the tank after pressurizing to clear any air trapped in the pickup tube. Using a soap solution, check for leaks. Reinstall to piping network.

NOTE

The pressure gauge attached to the tank valve should not be used to determine when the charging pressure has been reached. A pressure regulator must be used.

12. Replace all fusible links by following the instructions listed in the Installation Section.
13. Reset control head(s), accessories, pull stations and gas valves by following the instructions listed in the Installation Section.